The Metaphysics of Connection: Discreteness, Continuity, and In-discreteness.

by
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Abstract

An interest in individual, particular things is a normal and indeed necessary part of everyday thought, but for a number of reasons it is problematic when such thinking is formalised into a philosophical system. The feature which attracts about particular things is their *discrete* nature, which is evident as separateness, distinctiveness and self-containedness. Philosophical systems which have such a view of objects tend to emphasise features which make individuals distinctive entities, and to downplay features which support connection between entities, and similarity across entities. This project seeks to do a number of things which advance the understanding of connection: (1) To characterise the contrasting notions of discreteness and continuity, and to find an alternative to both, named *in-discreteness*, which enables continuity to be a productive concept; (2) To find within philosophical characterisations of substance some features which contribute to a new understanding of continuity; (3) To identify features in non-philosophical systems such as ecological psychology and dynamical systems theory which can contribute to an understanding of connection; (4) to assess some philosophical areas of interest which seem to embody in-discrete principles, such as cognitive science and meaning-holism, and (5) to apply all of these connection-friendly concepts to a reworking of process philosophy. The in-discrete reality which emerges is (i) composed of unbounded entities, (ii) dynamic, (iii) evolutionary, in the sense of every entity having a lineage, (iv) ecological, in the sense of being composed of mutually dependent connected entities, (v) indeterminate, in the sense of being immune to unique characterisation, and (vi) creative, in the sense of being unfinished and open.

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Table of Contents

Chapter One – Disconnection, Thought and Experience.

> We think of the world as containing particular things some of which are independent of ourselves; we think of the world's history as made up of particular episodes in which we may or may not have a part; and we think of these particular things and events as included in the topics of our common discourse, as things about which we can talk to each other. These are remarks about the way we think of the world, about our conceptual scheme. A more recognizably philosophical, though no clearer, way of expressing them would be to say that our ontology comprises objective particulars. It may comprise much else besides ... [I]t is a single picture which we build, a unified structure, in which we ourselves have a place, and in which every element is thought of as directly or indirectly related to every other; and the framework of the structure, the common, unifying system of relations is spatio-temporal. By means of identifying references, we fit other people's reports and stories, along with our own, into the single story about empirical reality; and this fitting together, this connexion, rests ultimately on relating the particulars which figure in the stories in the single spatio-temporal system which we ourselves occupy. (P.F.Strawson. (1959), *Individuals*, pp.15, 29)

1.1 Introduction – Disconnection, connection and thought.

Experience – Solidarity and individuals.

There is much to agree with in Peter Strawson's admirably clear statement of what he takes to be the dominant conceptual scheme, though we might wonder about how far we should accept his apparently commonsensical approach. Hence there is also much that is disquieting. A world of individuals is a world dominated by self-contained, separate things, and a nod to the "much else besides" which may exist has sowed the seeds of dissatisfaction about all that may be omitted from the analysis, and how they, not being the individuals of interest, fit into this world. A world in which the things are primarily related by their location in a structure is a world in which connection as such plays little part, because it is implicit, secondary to the nature of the structuring principle. A world

in which unity results from the things sharing the bare bones of this structure is a world in which unity is apparently taken for granted; and above all, an empirical reality that is so singular is a reality with little or no room for creativity, change and uncertainty. An ontology based on discrete individuals is a partial ontology at best, and it suffers from two significant and related philosophical shortcomings: (1) The "fallacy of misplaced concreteness", where a drive towards abstraction results in undue definiteness about the categorical or conceptual nature of reality[1]; and (2) a tendency to arraign a concept over and against an opposing concept, such that no middle ground is conceivable and a choice between the oppositions is forced.

My comments here are a little unfair, since I am using Strawson's work to illustrate contrasting positions and have no intention of confronting his arguments directly. My preliminary use of him, however, represents no straw man. He professes to be doing *descriptive* metaphysics, the basic research from which the more glamorous *speculative* metaphysics takes its cue, and which is distinguished in turn from standard conceptual analysis. As Strawson says, "Aiming to lay bare the most general features of our conceptual structure, it can take far less for granted than a more limited and partial conceptual enquiry." To reach the appropriate level of generality the descriptive metaphysician must burrow beneath the conventional layer of the everyday, since "the structure he seeks does not readily display itself on the surface of language, but lies submerged." His raw material is the "categories and concepts which, in their most fundamental character, change not at all … They are the commonplaces of the least refined thinking; and are yet the indispensable core of the conceptual equipment of the most sophisticated human beings."[2] There is a lot at stake then, in uncritically accepting a metaphysic of individuals. This thesis will attempt to clarify some of the issues raised by such an approach, and to propose some alternatives. It too will attempt to navigate beneath the surface of language and the veneer of everyday appearances, though one of its overriding aims is to make that veneer a respectable part of the whole.

Philosophy begins in experience. Experience leads some to wonder. And wonder can lead to philosophy, a style of abstract thinking from which experience is expunged. Taking some aspects of experience as definitive can provide a comforting,

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[1] Whitehead (1929), *Process and Reality (corrected edition).* (New York: Free Press). p.9.
[2] Strawson (1959), pp.9,10.

though perhaps misleading, belief in a reliable foundation for further thinking. Strawson's own characterisation of experience juxtaposes the obviousness of multiple, particular things with the singularity of a unified reality that we must seemingly create. The implication is that experience is primarily of separate things, though secondarily it may be of much else. By dramatic contrast, one of the most obvious features of experience according to Alfred North Whitehead is that in it we find "the obvious solidarity of the world"[3], and this is a sentiment echoed by John Dewey: "The isolation of nature and experience from each other has rendered the undeniable connection of thought and effectiveness of knowledge and purposive action, with the body, an insoluble mystery. Restoration of continuity is shown to do away with the mind-body problem"[4]. A metaphysic of individuals, such as Strawson's, embeds its objects in a matrix that supplies this solidarity, in the form of a universal structure of spatio-temporal relations. Whitehead's own process philosophy, on the other hand, has its objects growing out of this solidarity in a way he characterises as "organic", and hence the structure and the objects are not as separable as the individualistic approach might suggest.

The philosophy on show here will try to keep experience in its place, but not as the commonsense "appearance" from which the deeper truth of "Reality" is deduced. This will be done in part by reconceiving the relationship between appearance and reality, from a duality to a kind of unity. It is the nature of this "kind" of unity which will be the main subject of this work, rather than an investigation into experience as such, since it will become apparent that other divisions of the real such as that between the One and the Many introduced obliquely at the beginning of this paragraph are also resolvable. It is a hopeful outcome of this work that it will be established that there are no *necessary* divisions within the real. The uncritical adoption of a metaphysic of individuals will be presented here as associated with the dominance of the idea of *discreteness*, and this will be contrasted with its complement, continuity. It will be argued that the necessity for discreteness is a presumption underlying a wide variety of structural understandings of experience. Inasmuch as it is a presumption, and to the extent that discreteness is found to be a necessary condition of possibility for certain

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[3] *Process and reality*, p.7.
[4] Dewey (1929), *Experience and nature, (2nd edition)* (La Salle, IL: Open Court). p.xviii.

kinds of structure, I call discreteness, and continuity, *proto-structural* concepts. A significant aspect of the contrast between discreteness and continuity is a refiguring of the nature of relations, in such a way that the contrast fostered by a discrete metaphysic of individuals between relations and relata is reduced. The outcome will be a reconception of the nature of connection, which will in some respects parallel the analysis provided by process philosophies. The contrast between discreteness and continuity is not found at the forefront of debate, and the terms do not figure as premises in anyone's arguments. They are rarely encountered as substantive terms in philosophical discussion. They must be uncovered when thinking about the presuppositions which inform such discussions, and this is why they are proto-structural.

Disconnection – Appearance and reality, thought and world

Appearance and reality – already the contrast is loaded by the words we use to represent it. To be real is to be true, solid, present and useful. Appearance is, well, 'mere' appearance, little more than a diaphanous veil through which reality intrudes rarely, imperfectly, or not at all. Historically the distinction is taken to be a dichotomy, where the totality of all that "is" is divided in two by a fixed and nearly impermeable barrier, with the emphasis on each side being very much at the mercy of one's deepest beliefs. Most philosophical thought has aligned itself with reality, against mere appearance. The solidity of the barrier is conceived as "necessity"; it "must" be that way, since it is inconceivable that the barrier not exist, and there is only one way for it to exist. On one side is the really real, which has some emblematic features such as universality, simplicity, permanence, and compatibility with thought. On the other side are the attenuated and diminished cousins of these noble creatures; the particular, the complex, the temporary, things available to the senses. It is the apparently seamless integration of all of these characters that we call experience. It is the endless attempts to pull them apart that we call metaphysics.

A second way to think about how a necessary barrier intrudes into thinking about the world is to consider the influence of subjectivity. This is a complementary, though conceptually separable, way of considering the issues at hand, since it reverses the focus of inquiry from the outside in (where reality is screened off from me), to the inside out (where my attempts to know the real are validated or frustrated). It seems

perfectly understandable that I should feel rather special here, in being able to describe myself looking at you through *my* eyes, and making sense of *my* world, of which you are a part. My experience of my world is *mine* in a unique way, a way that you cannot share and I cannot easily describe. Moreover, I am *sure* about my experiences in a way you can only guess at. It would be very tempting to make some of these features of my personal experience the core features of the way I think about everything else, and this is exactly what generations of thinkers have done. Philosophical moves that enshrine the thinker at the heart of the thought, or as an alternative formulation, that give priority to critical aspects of subjectivity, have proved to be attractive. Their effect is to make us think of the world and thought as radically different yet peculiarly suited to each other. They range from Platonism in all its variations, through Cartesianism and its rationalist opponents, to modern idealist approaches that emphasise the modelling or construction of reality. Counter-moves which de-emphasise the thinker's subjectivity and give more weight to the world are rare and somewhat modern, though honourable mention should go to Aristotle; they include behaviourism and approaches to the philosophy of mind such as Davidson's which invoke a metaphysical holism. Phenomenology occupies a somewhat ambiguous position, as it has provided support for both positions. The point at issue is not the valorisation or denial of subjectivity, but the persistent belief that between the thinker and the object of thought lies a necessary and somewhat impermeable barrier, the inside of which has an essentially different nature from the outside. For idealism, reality just *is* this barrier[5].

Experience is a broad church; it supports to greater or lesser extent a huge variety of inconsistent understandings, and enables an endlessly fascinating range of actions and reactions. I have a pragmatic urge to reconceive the apparent disjunctions in thought in order to extract maximum value from their competing insights, and the most significant disjunction is that between individual particulars and an integrated world. "Solidarity" is a pretheoretical way of describing this integrity that leaves open the possibility of finding particular things (and much more besides) within it, whereas aggregating a world of individuals would seem to fall well short of a prescription for achieving solidarity. Hence on the present account it is problematic that the world

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[5] See Bergson's essay "Philosophical intuition" (1946a), in *The creative mind*. (New York: The Philosophical Library).

apparently consists of disconnected things and that this belief influences subsequent thought about reality, exemplified well in Strawson's words at the beginning of this chapter. However there are some good reasons for agreeing that the world does in certain respects consist of disconnected things, so my first move in the next section will be to attempt an understanding of disconnection in contexts ranging from fully embedded experience to philosophical detachment. There are also some good reasons for avoiding the converse of disconnection, of complete connection, a situation which has two aspects central to Asian philosophical traditions which I will briefly characterise; they are complete unity, and emptiness. It should be emphasised that these are deeply related, being two views on the same "reality" as very much at odds with the appearance of the everyday world. They represent an equally problematic opposite pole to the disconnected appearances described by Strawson.

The allure of unity is described well by the Swami Vivekananda, as quoted by William James: "This separation between man and man, man and woman, …, nation from nation, earth from moon, … this separation between atom and atom is the cause really of all the misery, and the Vedanta says this separation does not exist, is not real. It is merely apparent, on the surface. In the heart of things there is unity still. If you go inside you find that unity between man and man, women and children, races and races, high and low, rich and poor, the gods and men: all are One, and animals too, if you go deep enough, and he who has attained to that has no more delusion … He has traced the reality of everything unto the Lord, that centre, that unity of everything, and that is Eternal Bliss, Eternal Knowledge, Eternal Existence."[6]

Emptiness is described as the natural alternative to essentialism by the current Dalai Lama, Tenzin Gyatso[7]. Belief in the natural discreteness of objects is modelled on our belief in an enduring personal self, and both are quite wrong: "All things and events, whether material, mental or even abstract concepts like time, are devoid of objective, independent existence. To possess such independent, intrinsic existence would imply that things and events are somehow complete unto themselves and are therefore entirely self-contained." On this view of the essential self-containment

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[6] James (1955), *Pragmatism, and four essays from The Meaning of Truth*. (NY: New American Library)., p.103.

[7] Dalai Lama (2006). This is published as an extract from his own *The universe in a single atom* (2006). "The Om of physics" *New Scientist, No. 2534, 14 January 2006*, pp.46-7.

of objects, he believes, causation considered as exchange of influence cannot work, hence the attraction to him of quantum causation and its essential indeterminacy, operating at a more basic level than that of objects.

To wholeheartedly embrace connection characterised in these ways as a reaction against disconnection would be to fall prey to the extreme converse intuition, and to again miss the pragmatic point this time by completely ignoring the individuals in appearance. Both the unity and the emptiness intuitions, by conceiving of an ultimate reality unmarked by difference, sacrifice all the interesting features of reality considered as differentiation to a misplaced respect for raw objectivity. This objectivity is godlike in its detachment, and fully abstract in its disdain for individuals. The middle way, I will claim, is a way that respects continuity over discreteness in such a way that the individuals familiar to us in experience have some metaphysical clout – they have their powers and their places, though it requires a nuanced understanding of continuity to achieve this. The next section attempts to defuse the tension between abstraction and particularity in experience by placing them on a continuum, relating them through their mutual participation in intentional behaviour towards the world.

1.2 Experience of objects – a continuum from world to thought

There need be no absolute divide between recognition of concrete individuals and abstraction from them, in a way that would play off absolute connection against absolute disconnection. I illustrate that here with four scenarios that mark points along a continuum of cognitive styles directed towards objects, starting with a minimal or absent reflective stance coupled with pragmatic behaviour, and ending with full-blown philosophising unmarked by any sort of pragmatism. Another way of thinking about this continuum is in terms of the detachment of the agent from engagement with the object, which is absent or minimal in the first two scenarios. The effect of this continuum is to naturalise philosophical thought, that is, to make it understandable in terms of degrees of object-subject differentiation. It is apparent that each style of interaction with the world favours a different emphasis on both the subject and the object, though no style is exclusively adopted by any one thinker – we all experience the full range, to varying degrees. Knowledge of objects derived from the first stage, the ecological mode, has had an strong influence on “commonsense” thought about the world, which when coupled

with abstract philosophical thinking leads to an excessive theoretical faith in the necessary separateness of things, while the ecology within which objects have their meaning has been quietly forgotten. Here then are some of the ways in which the progression from concrete objects to abstract thought can manifest itself.

First, there is an unproblematic sense in which experience of the world consists of disconnected things, and which agrees to some extent with the primacy of individuals accorded by Strawson. This is the *ecological* sense. Ecological psychology acknowledges the mutuality between what perceptual systems are evolved to do and those aspects of the world of greatest relevance to the agents within which perceptual systems are embedded. It is objects that kill and maim, and objects that provide food, sex and comfort. These objects are relatively stable unities that it serves the agent's purposes to distinguish, however fleetingly, from their background. In this mode, objects are not merely reacted to and the agent is not just responding reflexively. The agent's goals, however, are quite local and relatively simple, such as moving about safely, survival, comfort and reproduction.

Even here, though, there will be questions about the experience of such things as routes and paths, and natural cycles of seasonality and growth, which cannot be easily subsumed under the head of experience of objects. More ecologically fundamental than objects are the perceptual elements which could be taken to be constitutive of objects - these are the basic units of ecological perception known as "affordances" [8]. They consist of critical environmental features such as textures, surfaces, and edges, and the discontinuities where these meet, and it is experience of the basic facilities they "afford" the moving agent that dominates in the ecological mode. These sorts of features do not necessarily align themselves with the boundaries of objects, so while being "constitutive" in a loose sense they are certainly not proper parts, and they are not usually considered to be part of the world of appearance, if appearance is taken to mean the superficial features of the world. Rather, they are relatively unchanging (even "invariant") elements of the perceptual world that convey valuable information about its nature or state, and in the view of ecological psychology are extracted or "read off" the world rather than calculated or imputed. To seek them out and respond to them is to

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[8] See James Gibson (1979), *An ecological approach to visual perception*. (Boston, MA: Houghton Mifflin).

encounter relative permanence in a form which is immediately available to the right sort of agent in the right sort of circumstance.

The potential for an ecological understanding of experience to provide a better grasp of the relation between particularity and solidarity will be explored in greater depth in subsequent chapters. For now, it will be sufficient to offer two examples of rather different kinds of environment-guided action in order to illustrate this point; they are (1) the visual "flow" created by forward motion, which consists of objects and features moving away from a targeted centre of motion in proportion to speed, and which provides crucial orienting information; and (2) the delicate feedback between the visual system and body schema which allows us to seamlessly (but skilfully) adjust our motion to accommodate steps and obstacles of varying sizes. In neither case is performance (that is, more effective movement) much enhanced by applying reflective capacity to the task. And it happens that the kinds of circumstances in which this mode dominates tend to flow into one another and not be disconnected sets of experiences, so objects and affordances are always part of a larger event. Experience is not exhausted by these survival-oriented encounters with objects. Part of the experience of being an agent, which I will not attempt to argue for here, is the experience of having experiences, and this kind of experience, while not exclusive to humans, is particularly characteristic of what we call consciousness. Hence what began as a description of a supposedly archetypal relation to objects in the service of immediate ecological needs has revealed an equivocation about the simplicity of that relation. Even as we respond to an object standing out in the most startling and attention-grabbing way we have the opportunity to also consider what it stands out from, and why it stands out just so.

The second stage on this progression takes the "standing-out" as its cue - it suggests a weaker sense in which experience is quite legitimately that of objects, and this relates to the unreflective use of things in the world in the course of the pursuit of goals that are not so immediate, though they may well be goals that fall along more or less lengthy elaborations of basic goals. I am thinking here of the kind of experience of objects captured by Martin Heidegger's use of "everydayness" and "ready-to-hand" to describe the practical involvement of an otherwise reflective agent in the ongoing nature of their world. The key here is that this kind of activity is ascribed to an agent equipped with relatively complex cognitive capacities, which they employ without apparent effort; activities that can be seen as continuous with the kinds of ecological object skills

outlined in the previous section. An example might be the absent-minded reaching for an empty bottle to hammer a tack into a wall – this will not be done after reflecting on the tensile strength of bottle-glass but by appreciating "intuitively" that a bottle can be wielded as a hammer, and that tapping will not threaten to smash it. This is an attitude towards objects more applicable to humans in particular than the ecological mode, which can be readily observed in a wide range of animals, though the use of the bottle as a hammer does illustrate the ecological notion of affordance, which I will be elaborating on at various points throughout this work.

My claim will be that the ecological mode, when properly considered as demonstrating an equivocal attitude towards objects, is best understood as a kind of mutuality between the subject (the user of some characteristics of the object) and the object (the supplier of some characteristics of the subject). This relation will be cashed out in terms of the proto-structural elements it embodies, which are neither discrete (referring to a relation between distinct objects) nor continuous (referring to internal relations between two parts of the same object). In the second, more complex, mode of relation to objects I am considering here, the relation is driven more obviously from the side of the subject, since the objects in question tend to be artefacts designed precisely to serve human needs, or which, like the bottle, are coopted for specifically human cultural pursuits. Taken for granted is the integrity both of object and subject, but either may fail. For example, on the edge of this unreflective awareness of a world of objects lies a kind of horror unglimpsed by most people, a horror of existential anxiety which may arise from the early failure of self-other differentiation. Failure to achieve this differentiation results in fears of being consumed by or being identified with objects of perception, as in "Julie", a schizophrenic patient of R.D.Laing's: "That's the rain. I could be the rain"; and, "I could be that wall. It's a terrible thing for a girl to be a wall."[9] The converse of this angst is the comforting intuition of connection and emplacement, well captured by Whitehead's reference to the "solidarity" of the world. His view, perhaps more representatively than Julie's, takes account of the way a ready-to-hand object can only achieve its status in relation to a background, a background from which it also stands out, and into which it will merge when task requirements change, which is why the

[9] Laing (1960) *The divided self: An existential study of sanity and madness*. (Harmondsworth: Pelican Books). p.198.

bottle-hammer loses its individuality when returned to the pile of bottles after the picture is hung. In this second stage of experiential detachment, as in the first, such a detachment cannot function simply as detachment, since that kind of unbidden response is also characteristic of people such as Julie. Instead it is performed in the context of ongoing activity, so is dynamic and partial. Some minimal detachment from the habitual uses of the objects at hand is necessary in order to devise a solution to a problem, such as mounting a picture on a wall, and to the extent that a ready-to-hand object satisfies the solution criteria it will be utilised. This can result in the standard use for the chosen object being overruled in a unique and creative way. This overruling owes little to cultural rules or customs, or to established philosophical wisdom about objects, since unlike the attitude towards objects to be discussed next, it occurs largely unreflectively.

The third step in the progression towards abstraction is particularly interesting, because it represents a case where sophisticated philosophical reflection is employed precisely to bolster, or at least to leave unthreatened, the everyday conception of objects referred to in the previous paragraphs. I am thinking here of Pyrrhonean scepticism, and the way in which its practitioners are encouraged to suspend belief about the truth of certain dogmatic assertions about the ways things are. Michael Frede unpicks the subtlety of the classical sceptic's views, in contrast to the sceptical position that nothing can be known. For of course such a position is itself dogmatic, and hence it tends to be a self-refuting claim to a certainty about the impossibility of knowledge. The classical sceptics adopted a heavily nuanced position which allowed them to "have a view" about the status of everyday things, where their impression that things are a certain way does not imply assenting to the truth or otherwise of the claim that things *really* are a certain way. In Frede's words, the Pyrrhonean sceptic "is not resisting or fighting against this impression, but implicitly accepts it by acting on it." [10] Writers who lampoon this position by telling of the sceptic having to be restrained from walking over a cliff have missed the point about the distinction between *believing that* x and *acting as though* x. The important point for my purposes is the implicitness of the sceptical "assent" at issue. The sceptical position resulted not from the acceptance of positive arguments about the fallible status of knowledge, but by the balancing of such

[10] Frede (1997), "The sceptic's two kinds of assent and the question of the possibility of knowledge." In Myles Burnyeat & Michael Frede (Eds.) *The original sceptics: A controversy* (pp. 127-51). (Indianapolis: Hackett). p.136,

arguments with equally positive statements about the truth of certain things, to achieve a pleasing suspension of judgement. A significant implication of the classical sceptical view is that such a sceptic should not accept a global distinction between appearances and any reality asserted to lie behind them – this distinction will assume greater importance in the following paragraph.

The fourth and final stage in this progression from object-alone to thought-alone is the full-blown philosophical analysis of the status of objects. Intelligence manifests itself not just in cunning manipulation of others, but also in seeing and speaking the truth. Getting at the truth requires "seeing through" those cunning manipulations on the surface of things, so it requires an amplification of the pre-reflective distinction between objects and thoughts of objects, to get a grasp of what lies behind the actions of others, what impels the observable events in the world, and why ordinary things are not really what they seem. These could describe the wisdom of all ages, but in philosophy this wisdom becomes something more, it becomes a cornerstone of particularly elaborate storytelling. That philosophical reflection may be afflicted by the less rarefied thinking referred to above is alluded to by Etienne Gilson, who focuses on the way philosophers since the ancient Greeks have dealt with the vexing relationship between the two metaphysical foundations of reality, being and existence, which in the thinking of many have been regarded as antithetical. These two concepts can be aligned with the fundamental distinction between reality and appearance, with "being" mapped loosely onto "reality", and "existence" mapped somewhat more securely onto "appearance". Gilson notes that "Since being is thinkable apart from actual existence, whereas actual existence is not thinkable apart from being, philosophers will simply yield to one of the fundamental facilities of the human mind by positing being minus actual existence as the first principle of metaphysics."[11] Hence the attraction of a distinction between the appearances of multiple things and the singular reality that lies behind them, an attraction the classical sceptics famously resisted.

The appearance-reality distinction has motivated a range of different philosophical responses. The ancestor-stories of these, which will be presented in more detail in the next chapter, all arise within a hundred years: starting with Heraclitus and

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[11] Gilson (1949), *Being and some philosophers (2nd ed.)* (Toronto: Pontifical Institute of Mediaeval Studies). p.3.

his appeal to unity underlying apparent opposites; then Parmenides and his appeal to a "higher" unity from which all appearance takes its cue; and finally the Atomists and their appeal to unity through combination. Notice that all of these stories share the word "unity". This is because the appearance-reality distinction plays out at two quite different levels, for both of which unity has a compelling role to play, since unity is a source of endless fascination and is typically thought to itself be the mark of a proper explanation. First, unity is implicated in the problem of what a *thing* is – a "thing" in its own right, given as a whole in appearance, or a collection of parts and features that just happens to form the "thing" once some unifying event has occurred. The ease with which we know the thing as a whole suggests quite naturally that its thingliness somehow accompanies its parts, and here "unity" names the compelling fit that many thinkers have found between the content of thought and the nature of objects. Second, the nature of the world within which objects appear, which includes the nature of the thoughts that find objects so congenial, is often regarded as unified in some way, and hence forming the "reality" that is contrasted with the scattered order of appearances. It is this kind of unity that Strawson describes as "a single picture which we build", founded on a common system of spatio-temporal relations. Explaining what unity is and how it is achieved constitutes a large part of subsequent metaphysics.

My thesis is a simple one. On the standard view, the concept of unity as it relates to objects, to the world in which they exist, and to immaterial things like concepts themselves, is taken to have some necessary and sufficient conditions that operate proto-structurally to determine its nature; these are the conditions of being bounded, and being complete. In short, the standard picture of unity demands *discreteness*. I accept that the converse of discreteness, continuity, is rightly regarded as an unpromising basis for unity. My counter-claim, therefore, is that there are numerous examples of non-discrete analyses of unified entities that do not invoke continuity, and that the failure of analyses based in continuity are not to be viewed as constituting failures in non-discrete analysis as such; what previous non-discrete analyses have not done is explicitly to acknowledge the proto-structural basis for non-discreteness nor to make explicit the idea of *in-discreteness* as such – to do so is the main aim of my work here.

1.3 The plan for this work

This chapter has introduced the worry that a very particular understanding of unity has had a detrimental effect on thought about the real. In particular, discrete thinking leads to a misunderstanding of alternative ways of achieving unity, and an ignoring of alternative forms of unity. The remainder of the thesis will develop an account of in-discreteness from a variety of directions. Rather than presenting an explicit argument for in-discreteness, the thesis will proceed by building up a picture of a plausible alternative to discreteness, first by looking at substantialist understandings of reality to glean a core conception of what features an explanation of reality must possess, then by explicitly investigating these features in the abstract, before detailing attempts to implement these features in various unconnected conceptual schemes. The most integrated attempt to do so is process philosophy, but curiously it has been criticised for not being connected enough! Finally some most general features of an in-discrete metaphysic arising out of consideration of process will be presented.

Chapter Two, *Disconnection and Connection: Historical Overview* will investigate some of the sources of the attraction to discreteness in philosophical history, and will look at some aspects of the concept of substance, as investigated by Aristotle and Aquinas, and by the post-Cartesian rationalists. Each conception suggests ways that discreteness can be overcome. However it is Aristotle's attempts to create a unified explanation involving the two fundamental attributes of substance (its intelligibility and its composition) that attract more than Spinoza and Leibniz' attempts to subordinate composition to intelligibility. Both rationalist projects are deemed to be undermined by their theological assumption that unity and totality derive ultimately from God and therefore have a limited worldly basis. In addition, Aristotle retains an emphasis on the dynamism and emergence of unity, rather than its presupposition as an attribute of God. The aim of the chapter is to present substance and its characteristics in the context of attempts to describe the universal substrate of reality, before an attempt is made to subject those characteristics to scrutiny.

Chapter Three, *Discreteness, Continuity and In-discreteness* will take the accepted accounts of substance and link them initially to the concept of discreteness, then will present some of the problematic features of discrete thinking, before discussing directly the concepts of continuity, and my suggested compromise between discreteness

and continuity, termed in-discreteness. The nature of duration, as described by Peirce and Bergson, will be investigated with regard to its claims to a form of continuity. The aim of the chapter is to introduce alternative ways of thinking about connection that may owe nothing to assumptions about discreteness, but which do not necessarily violate conceptions of substance. More detail of fully worked-out alternatives, developed in the absence of an explicit distinction between discrete and in-discrete thinking, will be presented in the following chapter.

Chapter Four, *In-discrete Applications* is a survey of fields of thought, some with well-established philosophical credentials, that have apparently instantiated in-discrete principles. These include holism in its broadest form, meaning-externalism, indeterminacy, and the implications of dynamical systems theory, particularly for an understanding of the broad study of thinking, which is cognition itself. These applications variously present the elements of in-discrete connection: holism provides the idea of global connectedness but without attributing equal weight to all connections; externalism provides the resources to conceptualise boundaries without falling prey to essentialist thinking about the fundamental difference between being inside and outside a boundary; indeterminacy can mean an irreducible lack of clarity for entities but is more productive (and closer in spirit to in-discreteness) if understood as the outcome of a multiplicity of perspectives on reality none of which is necessarily the truest; and finally dynamical systems as applied to cognition is a unified account which combines holism (neural), indeterminate and inessential boundaries both structural and temporal, multiplicity of constituent entities, plus open-endedness and the impossibility of completely accurate prediction. All of these in-discrete features will be found in a more general form in the metaphysics of process.

Chapter Five, *Process and Connection*, investigates in detail the nature of process philosophy, particularly that most explicit formulation of it by A.N.Whitehead. My conclusion will be that process, understood correctly, embodies in-discrete principles. The extent to which process truly is continuous has been recently called into question; another way of putting this is to say that the nature of the non-continuous or atomic nature of entities as central to process has recently been critiqued, as a significant detraction from the claims of process to continuity and indeterminacy. I show that this critique is motivated by an over-simplistic opposition between continuity and discreteness, and that the worries disappear on a more nuanced, in-discrete account.

Further, when applied to process, in-discreteness neatly ties together non-continuity, the core process principle of creative advance, and indeterminacy, in a more powerful analysis than the favoured alternative, pragmatism.

Chapter Six, *In-discreteness, Process and Indeterminacy*, draws out of process and related thought some in-discrete understandings of conceptual and ontological depth, causation and subjectivity, and indeterminacy. Although this seems like a very mixed bag of metaphysical issues it will be found to be united by a now explicit understanding of in-discreteness, and all of these more abstract elements can be found in process, pragmatism, Bergson, ecological psychology and dynamical systems theory. Methodologically, the structural demands of thinking about the relation between thought and the world are seen to be finely balanced between seeing them as two separate unities, or as two related elements of a greater unity. In-discreteness is most compatible with the latter approach, while phenomenology, which is seen to have similar metaphysical interests, is inclined (albeit with abundant qualification) towards the former. The contrast between an in-discrete understanding of dynamical emergence and phenomenological accounts of a similar emergence is strongest when the issue of subjectivity is concerned. Proto-subjectivity is considered to be an inherent element of a process-style in-discrete account, while it apparently requires some complicated additional processing on a phenomenological account.

Chapter Seven, *Concluding Remarks*, attempts to connect in-discreteness back to the problems of Chapter One.

Chapter Two – Disconnection and Connection: Historical Overview

Metaphysics in general tells us what we cannot know from our senses alone – it tells us what lies behind the phenomena of the everyday world. Two of the three founding stories in philosophy, those of Parmenides and the Atomists, make their cases for certain kinds of "reality" which recur regularly and dominantly in subsequent thinking, while the earliest, that of Heraclitus, can be assimilated into the later stories only with difficulty. Whitehead characterises these opposing storytelling genres as the metaphysics of "substance" versus the metaphysics of "flux", but notes that "…in truth, the two lines cannot be torn apart…; and we find that a wavering balance between the two is a characteristic of the greater number of philosophers."[12] I will delve into these stories in more detail below, not with a view to explicating them fully in their own right, but rather in order to draw out a particular implication for thinking about experience. This thinking was provided with some resilient foundations by these early stories. For now I want only to suggest that the standard sort of metaphysics tells of a world of appearance composed of THINGS, and what lies behind things are other fewer but more real entities that are, with increasing depth, also increasingly less likely to be directly experienced. Later in this chapter I will survey some developments of the early idea of "substance", as these too were attempts to reconcile particular things with a deeper reality. This will not be an exhaustive survey, but rather is oriented towards extracting some implications for connection and disconnection, discreteness and continuity.

Parmenides, Plato and most subsequent thinkers conceive of appearance as owing an essential aspect of its reality to another, more real reality. The deeper we delve, the less bothered we are by material reality, and the closer we get to this privileged if nonmaterial reality. The preferred method of delving is by the progressive refinement of the mind, which becomes capable of recognising the nature of the reality revealed as appearance is left behind. For the Atomists and subsequent science, by contrast, the deeper we delve, the smaller the elements of material reality get, and the more difficult it becomes to conceive of them as things. Nevertheless, it is an article of faith that the things of the everyday world can be built up from the inconceivably tiny

things of the subatomic world. By contrast with the Platonic insight, which sets appearance and reality off against each other, atomist science seeks a continuity between empirical experience and theoretical entities. It is a necessary consequence of both stories that the things of the world be separately identifiable – that they have a discrete nature and a determinate being. I will claim that these dominant stories encourage a worldview based upon ontological discreteness. Both of them can be seen to operate in the intellectual style known as analytic philosophy, which is concerned with breaking problems down into fundamental components (the difference is that Platonists would not expect these components to be available individually to sense experience). That is, analysis works from the top down, from a given unity to an extraction of its identifiable unified constituents, and then assumes that these constituents are the raw material from which the unity is constructed. This worldview may not be wrong, but it is incomplete. It is incomplete because a story built on discreteness will not be able to satisfactorily account for connection and relative continuity. The complement to this story is a synthetic worldview based upon ontological continuity, and explicating that worldview will be the major work of this project. Although this sounds like the creation of a discrete-continuous binary opposition, it is rather a justification for a continuum - in fact a particular strength of my formulation is that starting with discreteness yields only further discreteness, whereas the complement to discreteness, in-discreteness, is itself constitutive of a continuum.

One unsatisfactory response to the dominance of the analytic worldview is to deny the relevance of metaphysics altogether and to claim alternative forms of being for those aspects of the world, such as concepts and most things human, which do not fit easily into an atomistic picture. Ontologies of this sort may be presented as existing in parallel with metaphysics, but otherwise unaffected by it; however, this strategy is itself a metaphysical position. Metaphysics can be "escaped", then, only at the cost of incoherence. The genuine alternative to the dominant approach is to conceive of the world as being fundamentally less determinate than atomism would allow, and to devise a metaphysics that reflects this. At its limit this would entail a commitment to the continuity of all things, though expressed in a way that provides a principled understanding of separateness – the Dalai Lama's attraction to quantum indeterminacy

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[12] Whitehead (1978), *Process and Reality*, p.209.

notwithstanding, indeterminacy is on my account not seen as affecting the reality of objects. An allied task would be to explain how the resulting indeterminacy need not threaten the existence of larger and more complex objects, such as the way we "carve nature at the joints", even though it is not an indeterminacy of description but of object described. Those tasks begin here with a survey of classical attempts to understand reality, which early on responded to the equivocal nature of ecological unity with divergent insights. The relation between discreteness and continuity was a significant theme in classical thought.

2.1 Some founding stories

Heraclitus

Pre-socratic thinking was hugely influenced by Pythagorean ideas which had their roots in what even contemporaries called "mysticism", in virtue of the fundamental connection asserted between natural numbers, music, and the world. Starting from first principles, the natural numbers were deduced as a result of the primal unit first "inhaling" the Void, which causes it to split. Its products in turn are kept separated by the Void. By this means the objects of mathematical thought, primarily numbers and geometrical objects, are the basis for all reality.[13] It seems clear that such reality, composed of precisely defined and separate elements, is inevitably discrete. The extent to which Heraclitus can be regarded as responding explicitly to Pythagorean ideas is disputable, but what is not in dispute is the ascription of continuity or "flux" to his thought.

Heraclitus was an acute observer, and he was struck by both the variety in the world, and by its regularity. One manifestation of regularity is the notion of a lifecycle, applicable to living creatures and inorganic objects – things are "born", they grow and change, and they "die" and fade away. Nothing, not even a rock, stays exactly the same, and this is true of ordinary objects and at a cosmic level; eg (Fr.30): "This order did none of gods or men make, but it always was and is and shall be: an ever-living fire,

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[13] Kirk, G.S. & Raven, J.E. (1957) *The presocratic philosophers: A critical history with a selection of texts*. (Cambridge: CUP), pp. 252-3.

kindling in measures and going out in measures."[14] This process is continuous, but always partial – matter is not winking into and out of existence in the way physics now conceives of subatomic particles, which might result in a macro-scale object literally shimmering before our eyes, and which is the usual interpretation of Heraclitus' words. Instead, objects appear as they should, as stable and lasting, but we should understand that in any given period part of the object has been gained by transformation while another part has similarly been lost. Hence, all things change.

The second important aspect of this naturalistic thought is the stress on variety which is nevertheless a manifestation of connection and interrelation between things. There are ways of thinking which disclose relationships between apparent opposites, and these linking relationships are the expression of an underlying unity, which Heraclitus called Logos. The lifecycle mentioned above is itself one of these connecting elements – it unites disparate and apparently contradictory aspects of a life, such as youth and old age, or black and white (hair), or small and large (body). Other changes also involve a natural succession, eg (Fr.126): "Cold things warm themselves, warm cools, moist dries, parched is made wet"[15] . The point is not that these opposites ARE one thing, but that in their apparent contradiction they are united by something. Once Heraclitus opens our eyes to the ease with which these unities can be found, we can find them everywhere.

A third and perhaps most unusual aspect of Heraclitus' thought follows from the dual recognition that all things change and yet all things are connected – this is the understanding that the world of appearance is not just changing, not merely deeply interconnected, but that it is the product of permanent conflict, or strife. Apparent stability is a temporary or imagined truce in the dynamic tension between all things, things which are exchanging material between themselves in perpetual manifestation of the Logos; eg. (Fr.80): "One must know that war is common and right is strife and that all things are happening by strife and necessity."[16] For this strife to cease and for "stability" to reign would be death.

It would not be correct to give Logos the status of a deity or prime mover. It is not a being of any kind. Rather it is a unifying and motivating principle, a "formula of

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[14] Kirk (1954), *Heraclitus: the cosmic fragments*, (Cambridge: CUP). p.307.
[15] Kirk (1954), p.149.
[16] Kirk (1954), p.238.

things" as Kirk puts it[17] , or an order, which can provide a "measure" against which to judge things. It is the source of the intelligibility of things and events we perceive in the world, but it is not a Thing itself. The critical ingredients of this founding story, then, are (i) the natural importance of actually existing things; (ii) the impermanence of every thing; (iii) the connection of all things. In the next two sections I will be highlighting the radical difference between this story and its successors. However there is one significant feature which links this story to its successors – the striking extent to which thinkers have found, in the act of perception, a comfortable fit between the recognition of *things* in the world, and the *knowing* of those things.

Parmenides

Parmenides makes the connection between thought and world explicit for the first time (Fr.3 & 6): "…for to think and to be are one and the same", and "Speaking and thinking are the same as WHAT IS."[18] Like Heraclitus a generation before he too was influenced by the Pythagoreans, though in a strongly positive way. Parmenides took two important things from Pythagoreanism: first, the idea that there is one source for all reality; and second, the notion of the power of deductive reasoning to generate understanding. His conclusion was that reality is essentially indivisible. This leaves no place for the Void, and a good thing too: that comfortable dalliance between thought and the world cannot survive a brush with no-thing, as thought cannot entertain pure absence. Parmenides scolds those who would tarry with the negative (from Fr.8): *"I will not allow you* to say or think creation from nothing: IT ISN'T cannot be spoken or thought. If IT started from nothing what stirred it to being, and why sooner rather than later? IT must BE totally or not be at all."[19] There is no halfway house – being is either on or off. More so than Heraclitus, Parmenides is espousing a poetic, even mystical vision of reality. To know that reality requires training and effort. And although both their stories tell of what lies beyond the senses, I label Heraclitus' efforts as "counterintuitive" because his uniting reality is not spelled out, only gestured at in its obviousness, yet it was not understood because he refused to make it real in itself. Parmenides, on the other hand, relies on the

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[17] Kirk (1954), p.39.
[18] Lombardo (1982), *Parmenides and Empedocles: the fragments in verse translation*, (San Francisco: Grey Fox Press). p.14 (emphasis in translation)
[19] Lombardo (1982), p.15 (emphases in translation)

intuitions of his fellows, primed by decades of Pythagoreanism, to accept the *idea* of the One. He goes much further, though, in wanting his words to lead people, via the appropriate exercises, to appreciate the *reality* of the One. This reality is very strange indeed. The One is like a still, uniform, unchanging sphere, timeless and continuous and complete. If the end result of Parmenide's recommended process is to be a "vision" of the One, then the image of the sphere is the closest the human mind can come to knowing it.

Of course this is not "reality" as we usually know it, via the senses. Parmenides' Way of Truth has revealed the three building blocks of logical thought in its approach to the One: discreteness, respect for non-contradiction, and necessity. For Heraclitus the minutiae of the sensory world all have value, as expressions of the Logos. But for Parmenides the sensory world is of no significance, as it owes everything to the One. What it owes is its *being*. The being of something is akin to its identity, or its meaning – it is the "whatness" of a thing, in its actuality. This actuality, the existence of the thing, is completely given by its being, but in the sense of an epiphenomenon, having nothing "real" to do which cannot be sheeted home to being itself – hence, being and existence are two concepts which can now be thought separately, whereas prior to this they had been regarded as synonymous. Existence itself, on this account, is taken for granted, and evidence of existence in a sensory world is irrelevant.

It is difficult to understand the paradoxical concreteness which on the one hand Parmenides invests in something that doesn't itself exist (the One), and which on the other hand he denies to the existing things that are demonstrably concrete to us. The instability in this position is apparent: first, the complete subordination of the senses to logic leaves plenty of room for countermoves which occupy some of the middle ground between being and existence; and second, the metaphysical totalitarianism of Parmenide's vision leaves unsatisfied all attempts to understand the lived world. Enter Plato.

Plato and essences

Plato provides a sophisticated extension of Parmenide's fundamental intuition[20]. Being, conceived as identity, is still dominant, but it is no longer exclusively identified with existence. This means there can be degrees of reality associated with degrees of existence – not, of course, such that more reality is coupled with more existence, but quite the opposite, consistent with Parmenides. However the separability of existence from being allows Plato to conceive of being as both real in its own right (in a similar way to Parmenides' One), *and* as lending its reality to actually existing things, hence some things are "more real" than others. The metaphysical innovation which makes this state of affairs possible is called "essence". Essence names that which makes existing things real. The essence of an existing thing is "what" that thing is, its identity; but the subtlety of essence is that the identity in question is not the "personal" identity of a singular thing, but the natural kind identity of a species or type of things. Similarity between things is the result of their possession of a common essence, which in its commonality takes the name of Form or Idea. Hence the innovation that allows of degrees of being is the very same innovation that ensures the intelligibility of things by guaranteeing their identity.

There is a serious complication though – essence does not just make a cat intelligible in its "catness", it also makes its parts intelligible in their "liverishness" etc, and it makes other ways of conceiving of cats possible in their "furriness" or their "blackness". Every existing thing therefore shares in a multitude of Forms, each of which must be self-identical and complete. Inexorable logic is the enemy here, as it is apparent that every Form must itself share in the Form for unity, otherwise it could not be a unified thing, and this "sharing" threatens its necessary self-identity. Further, every Form must have within itself the capability of being compatible with other Forms, yet this incipient "otherness" cannot be native to a Form because that too threatens its self-identity. Insofar as the being of a thing is inherited from a more complete being, then there will be a problem conceiving of the completeness of this higher being, which must in turn inherit the being of attributes applicable to *its* level of being from…where? – an infinite regress threatens.

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[20] The following discussion of Plato is based on Gilson (1949), who makes the distinction between being and existence an explicit focus for discussion.

Plato is forced to invest the being applicable to the Forms themselves (eg, unity) in a yet higher level of being, thereby adding a third level to the two-level hierarchy of reality invented by Parmenides. His highest level therefore takes on the role of absolute source of being, in similar fashion to Parmenides' One, but it is a radically different "One" for Plato. This is primarily because it isn't really the source or wellspring of being at all, since that is taken care of by the Forms. Instead it must be a principle higher yet than being, and the only principle which the Forms can lack is their very *intelligibility* as unitary Forms. The highest principle is therefore a singularity of pure intelligence or thought, which has no being. In The Republic, Plato gives varying accounts of his three-tier metaphysic, and as might be expected, the highest level, having no being, is difficult to name – he uses "The One", and also the now widely accepted name of "The Good". This odd entity transcends being, transcends existence, transcends any intelligible transaction – and yet it is.

The Atomists

Early Atomism is an interesting hybrid of Parmenides and Pythagoras. It takes its cue from an early supporter of Parmenides, Melissus of Samos, who noted in passing that "If there were a plurality, things would have to be of the same kind as I say the one is."[21] He meant this to be an absurd possibility, that the Many should be like the One, but others took him seriously.[22] The One of Parmenides was recognised to be an inadequate model of existing reality with its emphasis on completeness, immobility, and singularity, though it accounted well for the intelligibility of the world. The Pythagorean model of self-similar but multiple numbers separated by the Void was an attractive alternative. Together, in the work of Leucippus and Democritus, these influences resulted in a robust attempt to marry sense perception to the underlying reality so persuasively described by Parmenides. The element of the sensory world most obviously lacking in the One was change and movement.

The fullness of the One left no room for movement to occur, and yet the Void was unthinkable; the completeness of the One left no need for change, and yet change

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[21] Kirk & Raven (1957), p.304.

[22] The following discussion of atomism is based on Kirk & Raven (1957), Kirk (1954), and Russell (1961) *History of western philosophy (2nd ed.)* (London: George Allen & Unwin).. These works represent fairly standard treatments.

was an undeniable part of the everyday world. Accepting the Void was a necessary first step from which a number of consequences flowed, and the first and most important was that it was now available to separate the components of reality, which, true to their source in the One, could retain its properties of homogeneity, permanence, and indivisibility. Since reality was no longer full, space was now available into which things could move; and since reality was no longer complete in itself but necessarily multiple, combination between infinitely varied atoms could result in infinitely varied, changing worlds.

The strength of this solution is evident in its persistence to this day. Atomism, with an accompanying dollop of Platonism, is the foundation story of science. Going beyond the senses now means telling a story about processes too small to see, or too weak to detect, or too short-lived to impact; but at their heart they are all material processes, and their relations are deterministic. More significantly than this was the nature of the materialism that gradually emerged as the Pythagorean influence on pre-Copernican science was replaced by Newton's metaphysics. The numerical atomism of the Pythagoreans was geometrical, meaning that the ultimate units of reality were limited pieces of space[23], describable by relations between integers. Newton's new understanding of gravity changed this picture in an important way – it concentrated the ultimate units into discrete objects or "bodies", while giving the critical role of the connecting, structuring principles to continuous objects called "laws of nature", which required a new mechanism, infinitesimals, for manipulating real numbers in order to be described. This move to consolidate being in atomic bodies has an additional benefit concerning the relationship between thought and the world which had so impressed Parmenides, since the Void no longer represents the unthinkable Nothing – it means that thought too can become "atomised" and associated with indivisible mental elements, which are capable of being built up into larger thoughts.

2.2 Essence and disconnection

The founding story that began with Pythagoras, received its philosophical impetus from Parmenides, and was fruitfully extended by Plato and his followers, is dramatically

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[23] Burtt (1932), *The metaphysical foundations of modern physical science*, (revised edition). (London: Routledge & Kegan Paul). p.42.

different from that of Heraclitus. The critical ingredients of this founding story are (i) the absolute unimportance of actually existing things; (ii) the permanence of every "real" thing; and (iii) the connection of all things. This last seems odd, since "connection" is acknowledged as one of the distinctive markers of Heraclitus' thought, not of his more analytical successors. The product of a hierarchical metaphysic in which the being of an individual is gained by descent from the more transcendent being of a One or a Form is bound to be profoundly *disconnected* from other beings, or so it seems if the descent of being is by a single route only. In what sense, then, can this be described as a metaphysic of connection? And does this concession threaten my critique of this founding story? Before answering these questions let me first explain what I mean by a hierarchical metaphysic.

The incompleteness of the discrete worldview can be partly revealed by gesturing towards what I called its "hierarchical" metaphysics of being, versus the possibly nonhierarchical metaphysics of continuity. The hierarchy in question results when actual beings are thought of as less important than a more privileged reality, whether this is the Platonic division between particular things constituted by Forms which are unified by the One, or the post-Newtonian atomism of bodies governed by laws of nature. For both worldviews the appearances are discrete, while the underlying reality is continuous. Strawson's presentation of particular things embedded in a common structure can, with little difficulty, be assimilated to this picture. The Platonic hierarchy in particular results in actual beings that have really inherited their being from transcendent entities, rather than their immanent ancestors. Therefore similarity with fellow beings is not so much due to shared historical, environmental and familial relations, but rather is due only to a common inheritance from the "parent" being, transmitted faithfully down the hierarchy. This results in a strong sort of separation from other beings, since all creatures are an amalgam of discrete forms, and the apparent similarities and actual worldly relations do not matter as evidence for any sort of connection which operates across, rather than down, the hierarchy. The "whatness" of a being is therefore as fully determinate as its very existence, though it need not be identical to it. A number of tensions are outlined below between discrete appearance and continuous reality that cannot be adequately defused within this hierarchical worldview. However their apparent insolubility may leave a space for a compromise position that offers to dissolve both the discrete-continuous and the appearance-reality dichotomies:

- *relations* between things must themselves be conceived of as things. Relations cannot be understand in purely discrete terms since they are often required to connect profoundly different things, but if conceived of as continuous they threaten to be more real than their relata.
- *change* in things cannot be understand in terms of discrete units of existence, as change threatens the basis of their being. An atemporal notion of time may appeal as a means of "fixing" change by rendering it unreal, thus preserving discreteness in the form of temporal parts, or a notion of essences may be required in order to fix identity if change is conceived of as continuous. These solutions are not compatible.
- *creativity*, or the production of new things from old things, or new things from no-things, is a special case of the change problem. Neither solution proposed for change will accommodate the production of novelty, since both are attempts to manage change away rather than accommodate it. Discrete thinking results in too little novelty, which can be thought only as recombination of existing forms, although the topmost being in a hierarchical structure may be endowed with the transcendent power to create ex nihilo. Continuous creation may be seen as resulting in too much novelty.
- explanation of the *beginning or origin* or the *end or purpose* of things can be unproblematic on a discrete account, but invoking a supreme being or the existence of an essence just displaces the question from the appearances onto the empirically impenetrable real. A continuous account can either ignore the questions as irrelevant, or reframe them in ways (for instance, as elements in becoming) that are incomprehensible to discrete thinking. Neither is an adequate solution.

These issues will be addressed in the chapters that follow. Now, as promised, I will look at the implications of a hierarchical metaphysic for disconnection and connection. It seems that both can be facilitated by a separation between particular things and the most real.

First, what are the implications for disconnection of a hierarchy? If what it is to be a cat was *solely* dependent on a Form for catness, then all "cats" would receive the essence of catness equally and exclusively; they would share nothing of their being with

any other organic or inorganic existing thing except through the commonality of all Forms such as is inherent in the Good. This disconnection, or separateness, operates at the level of the class or species called “cat”. As well, each individual instantiation of catness, each cat, would inherit the exclusivity of being inherent in this unitary notion of catness. The outcome is a reversal of the standard deterministic picture, where similarity results from shared historical, environmental and familial relations, as noted earlier. Instead, all the apparent physical similarities between individual cats would count for nothing, since the only real basis for similarity would be the presence of the self-similar essence of catness. To translate this into the language of genetic relatedness, an “essential” relationship seems akin to cloning, in that what really matters is the mutual self-similarity of the “offspring” and the “parent”, and the pure formality of the process by which the similarity is transferred intact from one being to another. I will return to this point after the next paragraph.

Next, what are the implications of a hierarchy for apparent connection? It turns out that actual things are conjunctions of uncountably many essences, which makes relations between otherwise self-identical essences problematic, as noted above. But this may not be a problem for connectivity. There is a sense in which our cat is connected to all things by virtue of shared essences. Essence of cat of course provides a common basis for all cats, while essence of fur provides an additional connection with mammals and fur coats; essence of liver links the cat to all carnivores perhaps; essence of cell nucleus connects the cat with all animals; essence of calcium links the cat to the mineral world; and so on. How plausible is this? It seems to turn on what kind of connection being related (or, more accurately, *being-related*) actually is.

If a being is multiply being-related to another being what kind of relationship is this, and how “close” is their connection? The biggest hurdle to overcome is the objection suggested but not followed through in my discussion of a singular essential relationship, above. If connection via a single common Form seems inadequate and formal, does embedding a being in a thick soup of such relationships add any real connectivity? I suggest that the answer is No, and that the reason for this answer turns on the broader question of what metaphysics is, which I cannot answer adequately in this work. Briefly, the formal relationship between a Form and its instantiation in a being is entirely passive - since all a Form does is to supply the germ of identity, and since identity is self-similarity, connection via essence is nothing much more than necessary

resemblance. The role of essence, according to its supporters, is to confer reality on a being, which is no small thing, and necessity is not to be sneezed at, but the necessity in question here is asymmetric – given that a being exists, it is necessary that its being be inherited from the Forms, but given that Forms exist, there is absolutely no necessity for them to be instantiated in any beings. And this passivity is entirely consistent with the essence of essence, which is to be self-sufficient, wanting for nothing. How could such a complete thing sustain a relationship with other essences?

This kind of passive asymmetry is typical of the kind of One-to-Many relationships instantiated in every computerised database, and the parallel may go further, since it is in the nature of these relationships that they work entirely passively by just being "pointed" to. For example the University of Tasmania student system may use the code "HBT" to mean "Hobart", and this meaning ("HBT = Hobart") will be defined just once in the system. This distinction between records of particular students and the top-level records that supply definitions is made for reasons of efficiency and minimising errors, reasons which might be considered to parallel the justification for a hierarchical metaphysic, but I will not attempt to argue for those parallels here. Every time the code HBT occurs (say in a student record) it passively inherits the meaning "Hobart" from the single place in the system it exists. The critical period of the creation of a new student record requires a validation of the entered code (which parallels the metaphysical requirement that no existing thing can come into existence without the participation of at least one Form), but "validation" is merely the limitation of what can exist, which is passive. Once the code validly exists in the student record the "Form" (or primal code) plays no further part in the code's existence, and the code continues to exist so long as the computer system maintains its normal operating integrity. This persistence has a parallel with the metaphysics of essence, in that once a being exists its integrity is assured so long as the One continues to maintain the integrity of the Forms. But the point is that nothing actually happens. A metaphysic requires an active principle in order to do its work, and nothing is further from the being of essence than activity; but I will return to this point at length later.

The underlying unity which begins with Heraclitus as manifesting in boundless difference and change is progressively *stripped* of actual existence; the intelligibility which is this underlying unity is *concentrated* into varying manifestations of being; and the principles which stand at the apex of the metaphysical hierarchy

become more and more identified with pure thought and less and less with actual existence. The Atomists insert a little more existence into this picture, though without threatening the hegemony of discrete being.

2.3 Connection, disconnection and substance.

Up to this point I have been investigating the implications for connection between objects, and for the nature of objects themselves, of a certain style of philosophical thought, a style that proceeds by seeking to uncover the really Real that lies behind the world of appearances. It is characteristic of this philosophy that what manifests in experience is to be treated with some suspicion, and is not to be taken literally as ultimately real. The Platonic philosophy separates the meaning of a thing from its physical constitution, and elevates the former over the latter. Therefore experience is not only of particular things in their actuality, it is also, more importantly, of those same things as certain *kinds* of things, and thinking of things as belonging to a class or species of things has a very great attraction - in a single act of thought it unites the actuality of *that* thing in its individual identity with the knowledge of *what* kind of thing it is. Knowing what a thing is, its kind, unlocks a whole host of related but subsidiary knowledge. However, this approach to reality is not the only way to understand the relationship between thought and experience, and it is not the only way that achieves a harmonious relationship. The idea of *substance* deepens the "appearance" to link the surfaces of objects with their innermost nature, and in restoring a role for the constitution of things it may provide some resources to bridge the separation of the discrete from the continuous, the appearance from the real. Following is a partial exploration of three very different understandings of substance, with the partisan aim of attending to their implications for connection and disconnection. I start with Aristotle, who collated and systematised earlier understandings in his famously equivocal concept, then Spinoza and Leibniz, who explore radically different monisms in reaction to Descartes' dualism.

Aristotle

There is a kind of alternative to the process of clarifying reality by referring to discrete essences that lie behind appearances, and it is an alternative largely because it begins with, and attempts to "save", appearances. The metaphysics of substance began with thinkers seeking the ultimate physical constituent of the world, so it took the world of evident things as in some way prior to thinking. Aristotle wedded these physical concerns with his own Plato-influenced interest in ultimate meaning to systematize the concept of substance, which in his work became a search for a first principle to explain the cause of a substantial reality composed of particular things in a way which was amenable to scientific investigation, and at the same time would satisfy our thirst for truth, "...so that as each thing is in respect of being, so is it in respect of truth."[24] Both of these pursuits inevitably arise from the world shared with and constituted by other people, so that Aristotle frequently begins his analyses by asking in what senses people typically use the term or concept under investigation. This suggests that he takes "appearances" in the broadest sense quite seriously - in fact he appeals not only to the obvious perceptual basis of appearance but also invokes a more social sense of "appearance" when discussing such varied things as rationality (for example, "...it is the customary which is intelligible"[25]) and truth ("...while individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed."[26]) Martha Nussbaum argues that these broad uses of appearance are a prime motivator in Aristotle's methodology, from his metaphysics to his ethics. What makes things *appear as* individual at all is not wholly a matter for metaphysical analysis, it is rather a matter for normally-equipped, rational, and acculturated people who maintain typical relations with the world to determine. Nussbaum concludes, "The appearances, then, can go all the way down."[27]

The individuality of things is given in experience, which experience normally includes knowledge of what kind of thing the individual is; and this is a knowledge dependent not just on the surface features of the thing but on an immediate

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[24] *Metaphysics*, Bk II, Ch.1, 993b30
[25] *Metaphysics*, Bk.II, Ch.3, 995a4.
[26] *Metaphysics*, Bk.II, Ch.1, 993a30.
[27] Nussbaum (1986), *The fragility of goodness: luck and ethics in Greek tragedy and philosophy*. (Cambridge: CUP). p.251.

understanding of what kind of body lies beneath the surface. Previous thinkers, says Aristotle, mistakenly looked for some special *component* of a thing in order to explain its reality; either a special something which makes the thing material, such as the elemental components of fire or water, or a something abstracted from the thing such as a Form which makes it what it is[28]. His suggestion is that nothing special or separable is necessary. Instead what makes a thing *that* thing in its individuality is the old idea of substance considered in a new way; because things considered as things are distinctively endowed with a certain unity which allows them to perform certain deeds. This displaces the question of what the really real is onto substance, so the proper question now becomes "what is substance?" The two critical aspects of substance in the preceding are unity, and performance or activity, and subsequent analyses of Aristotle have split somewhat over the respective importance of each. It is not my intention to comprehensively analyse Aristotle so as to satisfy all disputants, but it is consistent with my own interests in this project to keep both aspects as central as possible. Aristotle's naturalism, by contrast with the influence of his Platonist philosophical education, would seem to be most evident in his interest in the performance of natural functions, that is, in what things do. The metaphysical correlate of this is found in the medieval doctrine of *act* propounded by St. Thomas Aquinas, and here expressed by a latter-day Thomist, Etienne Gilson: "Everywhere there is action, there is an acting thing, so that we first detect substances by what they do."[29] What a substance does is to express its nature, and what Aristotle's concept of substance does is allow us to grasp the existence of this nature through its expression in the world, through the appearances.

In his translation and commentary on Aristotle's *Metaphysics,* W.D. (Sir David) Ross notes that Aristotle consistently maintains the early definition of substance set out in the *Categories*, namely, that in the most proper, primary and complete sense substance is that which is neither asserted of a subject nor predicated in a subject. Yet although the exemplars of substance are individual subjects such as a particular man or horse, Socrates or Sea Biscuit for instance, substance itself functions as a predicate, and is the last we come to in a line of questions such as "What is this thing? A man. What is a man? An animal. What is an animal? A substance."[30] This ambiguity or tension

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[28] *Metaphysics*, Book 1, Ch.8
[29] Gilson (1949), p.43.
[30] Ross (1953), *Aristotle's Metaphysics: a revised text with introduction and commentary.* (London:

between substance thought of as the concrete thing and as its essential nature is present throughout Aristotle's treatment of substance. It means that the candidates for substance (essence, the universal, the genus, and the substratum) are often discussed using older concepts in new ways. They are subjected to a new kind of test, for the significance or weight they bring to bear on the *definition* of what any thing is. This is a stringent test, because substance must be capable of the dual function of making that thing intelligible as an individual and as an exemplar of some more general entity. Essence (considered as a pure inner nature) and universals fail this test for opposing reasons: Essence because its purity means that it necessarily cannot sustain relations with other terms in a definition, and universals because they are common to many and hence not unique enough[31].

In many respects, the best candidate for Aristotle's substance appears to be the substratum (*hypokeimenon)*, or underlying layer; that which precedes any qualities or temporary features of an entity. Substratum may mean the matter alone, or the sensible form or shape alone, or a complex blend of the two. Bare matter, while it does result from a conceptual process of stripping other attributes away, cannot be substance because it lacks individuality[32]. The complex things of most importance to us are sensible individuals, which consist of a form combined with a certain matter. It turns out that, except in special cases, form or essence cannot be a substance unless it is associated with matter[33]. These considerations tend towards the conclusion that substance is essence, but it cannot be the essence associated with the universal, nor can it be a unique personal essence; it cannot be fully divorced from matter, but neither can it be thought of as a component existing alongside the material components, nor as itself having material components. In short, says Ross, substance must be thought of as a *principle of structure*[34]. Not all structuring principles indicate the presence of substance – for instance, a bundle of sticks tied together is structured by the tie, but it is not a substance. It demonstrates, however, a critical feature due to the element of form in true substance, that it provides actuality to the potentiality which is the structured matter. This means

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Oxford)., pp.lxxxiii-iv.
[31] Ross (1953), pp.xcv, cvii.
[32] Ross (1953), p. xciii.
[33] Ross (1953), pp. cv-i. Those special cases include God, and the intelligences that move the spheres.
[34] Ross (1953), pp. cxiii-iv.

that for perishable things it is only those "held together by nature" and unified by their power of self-movement that are substances.[35]

The distinction between actuality and potentiality ushers in one of the grounds for dispute between subsequent commentators. The standard view is that Aristotle thought that the principle of structure was common to a species, and that matter played its part by at least allowing plurality of individuals, if not necessarily enabling their individuality. Aristotle's own words are clear about the role of form, though ambiguous about the role of matter: "The whole thing, such and such a form in this flesh and these bones, is Callias or Socrates; and they are different owing to their matter (for this is different), but the same in species, for species is indivisible."[36] The Thomist view is that each form is unique to a particular individual, which is why the activity of substance is an expression of its individuality. Mary Louise Gill has recently evaluated the evidence for these related disputes in Aristotle scholarship about the status of species versus individual forms, and the status of matter, although her analysis is not coloured by the Aristotle-Aquinas distinction. She is responding to an influential conclusion by Frede and Patzig (1988), that Aristotle was committed to individual forms. Their analysis made use of a distinction between an *individual* form, which could be inherited, and a *particular* form, which though qualitatively indistinguishable from others of the same species nevertheless is numerically distinct[37]. Part of the problem of the universal form and the individual form, says Gill, dates from confusion in the 1960s and 1970s that surrounded the Categories' definition of substance, in terms of which "man" (the species) is referred to as the secondary substance and the individual man, Socrates or Callias, as the primary substance. This was apparently contradicted by the Metaphysics Z conclusions about species as the universal form of substance. The confusion was resolved by Driscoll's (1981) argument that the species of the Categories and the form of Metaphysics Z, though both are called "*eidos*", are not the same. Metaphysics Z treats species as *universal composites*, including form and matter taken as universal. Therefore Socrates' (the substance) species is man, his form is his soul. The commonly accepted resolution of the species-individual dispute seems to be a compromise – Gill reports that

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[35] Ross (1953), p.cxiv; *Metaphysics*, H.1043b21-23.
[36] Ross (1953), p.cxvi-ii; *Metaphysics*, Z.1034a3-5.
[37] Gill (2005), "Aristotle's metaphysics reconsidered." *Journal of the History of Philosophy, 43 (3),* 223-51. pp.230-1.

the weak claim that no universal is the *substance of* that of which it is universally predicated is now standard, which means that form can be predicated universally of chunks of matter, but is not the substance of those chunks. Instead it is the substance of composites, or substance in the secondary sense.[38] This leaves something unique operating to characterise each individual, though it is unclear whether it is matter or an individual form.

The question of the role of matter now becomes quite important, for unless you want to accept the view that the proper individuating element is an individual form for which "soul" is an appropriate term, the only alternative seems to be to ascribe the individuating role to the matter which is organised by the universal form. Note that the view that matter cannot exist apart from form implicitly supports the view that every instance of organised matter (a subject) must be associated with a form; on the view that "prime" matter can exist alone, the relation between form and matter is accidental, while on the opposing view their relation is essential[39]. The reconciliation reported by Gill as "increasingly favoured" is quite complex, but once again it is a true compromise. On this view Aristotle combines "top down" teleological explanations with "bottom up" material-efficient causal explanations. The higher level organic parts are essentially determined as what they are by the form of the organism, and the matter associated with these parts can be called the "functional" matter. The lower level materials that constitute those higher parts are independent of the form, and can be called the "constituent" or "remnant" matter[40]. Socrates, as a composite of this type, would be regarded as secondary substance, which leaves those who believe that he should be regarded as primary substance due to the presence of an individual form unsatisfied. Aristotle was by no means committed to the absolute logical separation of form considered as actuality and matter considered as potentiality, and he suggests a way to save composites as primary substance, writing "for each thing is some one thing, and the thing in potentiality and the thing in actuality are somehow one…"[41] Interpretations of this, naturally enough, diverge. The "non-explanatory" approach claims that he means that genuine material substances, that is living organisms, are basic unities, and that

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[38] Gill (2005), pp.232-3.
[39] Gill (2005), p.236.
[40] Gill (2005), pp.236-7.
[41] Gill (2005), p.242. *Metaphysics* H.1045b17-22.

matter and form are not real components but only conceptualisations of structural elements; while the "explanatory" approach asserts that at least one of the pair matter/form or potentiality/actuality is basic, which means that Aristotle's task is to explain their relation.[42] My preference is for the interpretation that emphasises the unity of the elements in an irreducible amalgam, and although it isn't apparently possible to show that Aristotle conclusively proved such an interpretation, it is justifiable as a significant and coherent aspect of his metaphysical thinking. The question then becomes, given a certain understanding of an irreducible unity, how does the teleology attributed to the form manifest? One answer might be, as activity directed towards the organism's self-preservation.

It seems fair to say that the contribution of form to substance results in more than merely *inert* matter, even on the standard view. You do not have to be a Thomist to detect the recurrent interest in dynamics in the Metaphysics. George Blair looks at the relation between two terms Aristotle coined to describe the inner working of substance: ενεργεια (energeia) and εντελεχεια (entelecheia)[43]. Both words have been commonly translated as "actuality" but they mean, more literally, "(internal) activity" and "having the end within" respectively. Not only has their rendition as "actuality" obscured the dynamism at the metaphysical heart of beings, but as Blair's analysis shows, Aristotle's replacement in the course of his writing of "having the end within" (εντελεχεια) by "(internal) activity" (ενεργεια) in his discussions of the distinction between potentiality and actuality has a significant impact on his meaning. The following translations of a passage from the "summary" book, for example, have quite different implications for an understanding of substance. In the Greek, Metaphysics K 1065b14-16 reads: διηρημενου δε καθ εκαστον γενοζ του μεν δυναμει του δ εντελεχεια, την του δυναμει η τοιουτον εστιν ενεργειαν λεγω κινησιν. Compare the following:

(i) (The "standard" translation by Sir David Ross) "There being a distinction in each class of beings between the potential and the completely real, I call the actuality of the potential as such, movement."

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[42] Gill (2005), p.242.

[43] Blair (1995), "Unfortunately, it is a bit more complex: reflections on Ενεργεια." *Ancient Philosophy, 15*, 565-580. He is participating in a philological dispute about the interpretation of these terms. His suggested resolution of the dispute preserves the complexity of Aristotle's analysis of being, as well as reinforcing the internal consistency of Aristotle's thought which would be threatened if the alternative resolutions were to be adopted.

(ii) (Blair's translation) 'Now that the potential has been distinguished from *what has its end within it* in each case, the *internal activity* of the potential as such is what I call "process"'[44].

Blair's claim is that in his later work Aristotle realised that his previous distinction between the teleological interpretation of the activity appropriate to biological organisms (entelecheia) and the purely energetic interpretation appropriate to the nonbiological (energeia) was unnecessary, and that his meaning could be conveyed by the latter term alone, as in the quoted passage. This approach helps to clarify a useful distinction within the concept of "nature", between the doing, as act or process, and what is done, as characteristic of that substance. While it is not my intention to attempt to present Aristotle as a process philosopher, Blair's findings with respect to the temporal dimension of actuality, which could be described as becoming, are consistent with a recent analysis of Aristotle's teleology. Christopher Mirus, who notes that several contemporary writers attribute the roots of Aristotle's teleology to his biological interests (and this might include Blair), points out that "entelechia" (Blair's "having the end within it"), although found in the biological writings, signifies both form, or first actuality, and activity, or second actuality. The primary actuality brings with it a capacity for further actuality, for activity of a certain kind, which complements neatly the account of potentiality considered as a capacity to pass into a new state of itself, which is more precisely known as immanent potentiality[45] (recall that potentiality is the function attributed to matter, not form). The teleology, Mirus concludes, is not biological, not even inspired by nature in general, but is a direct consequence of Aristotle's metaphysics[46]. Hence the respective roles of form and matter in substance, although distinguishable in principle, become increasingly interwoven as they are considered metaphysically. This respect for the deep connection between self-directed activity, becoming, and form, is characteristic of the full-blown process philosophies I will consider in more detail later.

This is not the place to discuss the broader question of particulars and universals. However it is clear that Aristotle intended his concept of substance to bridge

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[44] Blair (1995), p.573.
[45] Ross (1953), p.cxxiv.
[46] Mirus (2004), "The metaphysical roots of Aristotle's teleology." *The Review of Metaphysics, 57 (4)*, 699-724. pp.699-700.

the metaphysical divide between universal concepts, which had dominated philosophical thought to his time, and his own innovative concern with particular things. Aristotle's substance succeeded where previous views of substance and the Platonic philosophy of Forms could not, in endowing individuals with metaphysical importance. It did this by making their existence as *that* particular individual intelligible in its own right, by virtue of its own inherent characteristics, which resulted from a tightly-woven unity of matter and species form. In doing this it avoided the disconnecting tendencies of the more comprehensive pantheon of essences unleashed by Plato, since the most salient form provides commonality with a lineage of similar creatures, while unruly matter contingently incorporated into the becoming enhances its uniqueness. Unlike Plato, too, the substances of most interest are other living beings, and their relationships are of utmost significance.

My discussion of the problems of connection and disconnection in substance will continue by looking at the substance metaphysics of Spinoza and Leibniz. I will pass over Descartes, whose fascination with spatiality led him to consider extension as the defining feature of substance, resulting in the famously incoherent dualism of mind and matter, which placed an essential disconnection at the heart of philosophy. Spinoza and Leibniz, on the other hand, represent two logical extremes of reaction to Cartesian substance dualism which attempt more directly to address the question of connection: On the one hand, a single substance which is both material and mental; and on the other, a multitude of substances neither material nor mental.

Spinoza

For Spinoza there is only one substance, which in its infinite perfection is God, but in its everyday manifestations its attributes are shaped by its interactions with other manifestations of substance and are perceived by the intellect. What we call "things" are just temporary manifestations of substance – Spinoza says of this conclusion "No doubt it will be difficult for those who think about things loosely, and have not been accustomed to know them by their primary causes ... for such persons make no distinction between the modifications of substances and the substances themselves, and are ignorant of the manner in which things are produced; hence they attribute to

substances the beginning which they observe in natural objects."[47] Things arise out of the substance background by virtue of the activities of other things, and the more of this activity there is, the more reality a thing has[48]. Consequently there is little emphasis on the powers of individual things, as these powers depend almost totally on the cumulative influences of their environment. Spinoza says "Things which are produced by external causes … owe whatsoever perfection or reality they possess solely to the efficacy of their external cause, and therefore their existence arises solely from the perfection of their external cause, not from their own [perfection]." [49] I will desist from giving more detail of Spinoza's metaphysics directly, and instead will look first at some modern applications of his monism before turning to a discussion of the implications of his metaphysics for connection and disconnection.

Modern Spinozism

The kind of causal holism hinted at in the above sketch of Spinoza's monism apparently offers support for a metaphysics of connection. It has especially inspired deep ecologists such as Arne Naess[50] and Freya Mathews[51] , while the possibilities for a new ethical understanding of connection have been explored by Moira Gatens and Genevieve Lloyd[52].

Naess defends an understanding of the relational nature of reality, rather than what he characterises as the Newtonian/Kantian view of absolutely objective "things *in themselves*" (his emphasis). For him, supposedly objective descriptions like 'oblong' and 'square' are "not subjective, but, like smell, *bound in an interdependent relationship* to our conception of the world ... It is justifiable to refer to them as objective in the sense of being independent of a person's likes or dislikes. We arrive, not at the things themselves, but at networks or fields of relations in which things participate and from which they cannot be isolated."[53] Humans have an ego, however, and ego is more than just a *belief* (potentially mistaken) in personal separateness, but is the *experience* of

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[47] *Ethics*, I, Prop. 8, Note 2
[48] *Ethics*, I, Prop. 9
[49] *Ethics*, I, Prop. 11, Note
[50] Naess (1989) *Ecology, community and lifestyle: Outline of an ecosophy*. (Trans. & revised by David Rothenberg) (Cambridge: CUP)..
[51] Mathews (1991) *The ecological self.* (Savage, MD: Barnes & Noble)
[52] Gatens and Lloyd (1999) *Collective imaginings: Spinoza, past and present*. (London: Routledge).
[53] Naess (1989), pp.48-9. (Emphasis in the original)

separateness. In a Spinozistic metaphysic as developed by Naess, ego becomes a particular instantiation of the more general idea of self-perseveration or (Naess' term) "*Self*-realisation", where beings persevere in their own way of being and strive for life, which is more than just staying alive. This is complemented by a broadening identification with first, all humans, then all living beings, and finally with the totality. Identification takes the basic striving and multiplies it into an extreme joy as the individual merges into a greater totality[54], but the individual is not dissolved. It is a mystery, says Naess, that widening identification is checked by Self-realisation and does not result in complete merging with the Oneness[55].

Mathews too seeks the metaphysical foundation for an ethics of connection she finds in Spinoza, and she finds his monism an attractive path to this goal[56]. Here the relational connection is secondary to the monism, as the unification of the One is seen to overcome the social and ethical consequences of centuries of Newtonian atomism. This atomism as a cosmology has been progressively sedimented into western mythology, she says:

> It answers the questions, what are we, whither are we going and from whence do we come, in no uncertain terms: we are aggregates of atoms coming from atoms and bound to return to them. Newtonian cosmology discloses a world which, while not hostile to our concerns, is monolithically indifferent to them … It is Newtonianism which embodies the fact/value distinction, portraying the world as inert, insensate, devoid of telos, of value, purpose and meaning.[57]

Like the Dalai Lama, quoted earlier, Mathews finds modern physics to be more compatible with her desired metaphysic than its predecessors, although she thinks that quantum mechanics is currently too incomplete and prefers instead the 'speculative extension' of Einstein's General Theory of Relativity known as geometrodynamics (or GMD)[58].

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[54] Naess (1989), p.83.
[55] Naess (1989), p.173.
[56] Mathews (1991), pp.1-2.
[57] Mathews (1991), p.46.
[58] Mathews (1991), p.2. She attributes the GMD concept to physicist John Wheeler.

The vision of 'spacetime' within GMD accords with monist principles, says Mathews: It is single, extended, universal, indivisible and continuous[59]. These features do not enforce uniformity and lack of differentiation on either spacetime or substance monism, however they do emphasise the substantival nature of both at the expense of relationality[60]. Such a substance fills reality with no remainder – it is a plenum and exhibits the quality of plenitude. Mathews finds in Spinoza an explicit alignment of this idea with the qualities of space[61], and this allows her, following Spinoza, to conceive of individuals as merely appearing to be separate beings, since bodies are continuous with space which is itself indivisible. Hence bodies are disturbances, or 'wave-knots', in the local fabric of spacetime[62]. Her contrast of plenitude with a pluralistic metaphysic, such as atomism, emphasises certain aspects of continuity: it is a unity, it has no discontinuities (gaps or edges), and it has no boundaries. Continuity is seen as logically prior to connection, in this story. The role of connection which so impresses Arne Naess, expressed as a relational ontology, must await an account of how individuation can occur in substance.

Curiously, when Mathews comes to discuss the nature and appearance of individuals, substance monism slips into the background. In fact substance-talk is replaced by function-talk in the form of systems theory, in particular the crucial distinction between living and non-living systems formulated by early champions of the systems concept such as Gregory Bateson. For living systems, beyond the homeostasis and simple regulatory functions Bateson emphasised are more abstract functions such as 'equifinality' (where many different developmental paths reach a similar conclusion[63]) and self-realisation, This last has close similarities with Humberto Maturana's concept of 'autopoiesis', which I will discuss in the next chapter. A self-realising system, unlike a rock, "actively determines and preserves its own perimeters, thereby creating an objective unity."[64] It becomes an agent, a being with interests, which values and is valued.

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[59] Mathews (1991), p.60.
[60] Mathews (1991), p.65.
[61] Mathews (1991), pp.77-82. She emphasises that this interpretation is unconventional.
[62] Mathews (1991), p.83.
[63] Mathews (1991), p.96. The concept is attributed to Ludwig von Bertalanffy, the so-called "father of system theory (see, for example, *General system theory*, 1968). Cf. the attractor concept in dynamical systems theory, which I discuss in Chapter Four.
[64] Mathews (1991), p.104.

There may be higher-order self-realising systems of which the agent is a part, and which in turn provide the conditions of possibility for the individuation of agents. For Mathews, this hierarchy of systems nested within systems is a vision in which "intrinsic individuality is consistent with – indeed entails – intrinsic interconnectedness."[65] Here is one way in which monism asserts itself in relation to "individuals", since such a nesting relation preserves the continuity of the whole and potentially allows all levels of organization, up to and including the totality, to be characterised in terms applicable to self-realising individuals. Mathews links self-realisation to the medieval notion of "conatus" or self-preservation taken up by Spinoza, who says that things express their essence by endeavouring to persist in their own being – this involves resisting the influence of external bodies and forces. For him, however, all things, not just higher organisms, exhibit conatus, and here the "resistance" at issue can be seen as akin to the inertia seen in purely physical bodies which resist changes in motion; a rock, for example, tends to remain a rock. Mathews wishes to restrict conatus to self-realising beings in the enlarged 'system-theoretic' sense of nested systems referred to above. This ability to appreciate the selfhood of the whole exposes a difference between the Naess and Mathews interpretations of Spinoza, according to Mathews – she argues that an emphasis on relational connectedness under-motivates an understanding of the selfhood of the whole, and hence its intrinsic value, by grounding the connectedness ultimately in anthropomorphic, human-centred interests. By contrast, the self-realisation Mathews proposes would commence with the universe as its highest manifestation, giving us independent grounds for loving it[66].

There are two related concerns about Mathew's argument for the redemptive potential of Spinoza's substance monism. First, there is something troublingly arbitrary in the way she has replaced Spinoza's conatus with her own conception of self-realisation, since nested systems from individual organisms *upwards* apparently can exhibit it, while nested systems below the organism level cannot. This suggests some special integrative powers available to the individual that cannot be found in the individual's own nested components, and the obvious candidate is a "self" modelled on our own psychological attributes. Far from promoting the integration she seeks via

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[65] Mathews (1991), p.107.
[66] Mathews (1991), pp.150-1.

monism, this move can only result in furthering the separation we already experience due to our faith in the power of our reason, which by definition is denied to lesser creatures. Rather than connecting us with nature, this move succeeds only in connecting us to god.

Second, although individuality "entails intrinsic interconnectedness" in the superficial sense of "internal" connection not being independent of "external" connection, it is clear that such self-realisation is to some extent purchased at the cost of interconnectedness, as organisms strive to minimise their dependence on external links. This serves to undermine the commitment to connection. The autopoiesis concept captures this asymmetry more accurately by focussing on the *autonomy* of the individual, but this is consistent with the explicit commitment to systems thinking espoused by Maturana and Varela, which allows them to use notions of input and output without fear of compromising any commitment to connection. As with Mathews' use of self-realisation, her invocation of intrinsic connectedness seems to invert the metaphysical aims of Spinoza. It is tempting to ascribe both problems to her interest in the nature of the One, or God, which nature Spinoza himself strenuously avoided making too literal.

Process philosophy, particularly as developed by Whitehead, would seem to have the resources to cope with both worries more adequately. The first worry, of an apparent discontinuity as self-realisation operates at or above the level of individual organisms, will be dealt with by re-engaging with Spinoza's broader notion of conatus and thereby dissolving the arbitrary barrier which denies substance its "subjectivity" (a term just as loosely, and appropriately, applicable to substance in its own way as conatus). The discussion of Aristotle's substance has already revealed the extent to which a sensitive appreciation of the nature of beings cannot deny an irreducible relation between that which constitutes and that which "motivates" them. Although Aristotle's emphasis is on living things, and especially self-moving ones, the unity of form and matter is applicable to all beings. Process philosophy will broaden the scope of this irreducible relationship to ascribe a motivating element, described as a form of subjectivity, to all substance. The second and related worry, that the account of interconnectedness is undermined by talk of self-realisation, will be more adequately dealt with in process philosophy by eschewing the totality as such, and attributing a *genetic* relatedness to entities which acknowledges their lineage and the partiality of

their links to their environment, rather than their placement within an all-encompassing system of relations. There will be no fixed totality for process; instead the continuous expansion of reality, or the "creative advance", will implicate all creatures as combinations of their genetic inheritance, which emphasises their developing individuality, and their causal connectedness to all things. Process theory will be investigated in more detail in Chapter Five.

Gatens and Lloyd, like Mathews but unlike Naess, make detailed references to Spinoza's metaphysics, and like both ecologically-inclined writers their interest is in the ethical implications of his work. More subtly than both, their interest is in Spinoza's conception of "imagination" and the way it can generate a new understanding of inter-subjectivity and collective social behaviour. This means that, unlike Mathews and Naess, they pay most direct attention to Spinoza's idealism, and only indirectly to his monism, since they are less interested in the metaphysics except as a means to their own ends. Imagination is the medium by which external bodies can be known, thanks to its status as the immediate coming together of body and mind. Mind is the idea of body, and the object of this idea is the actual human body. Minds are constituted as awareness of bodily modifications, and through these modifications we become aware of bodies other than our own. Bodies can become synchronised and move in unison, and are thereby "compound bodies". We can conceive of such composite individuals as a nested hierarchy, each within a larger individual, and in Spinoza's words, "may easily proceed thus to infinity, and conceive the whole of nature as one individual"[67]. Furthermore, our experience of other bodies influences the intensity with which we feel the modifications of our own body; our desires, joys and pains. This is a bottom-up path to conceiving of the totality, and framed in this way it has obvious implications for collective behaviour and ideas of community.

The concept of conatus, the struggle to persist in being, although important in Spinoza's understanding of individuality, also unifies the emotions and imagination. Imagination allows associations between images (bodily states) to be available to reason, and in so doing it plays an essential role in directing purposive behaviour towards the satisfaction of desires. Imagination also provides the basis for empathising with others – Gatens and Lloyd conclude that "To understand the operation of the passions in

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[67] Gatens & Lloyd (1999), pp.12-3; Spinoza, *Ethics*, Part II, P13, L7, Note.

individual life is at the same time to understand the relations of collaboration and antagonism which bind human beings together in society."[68] These relations, like all others for Spinoza, are necessary and deterministic, and there is no place for freedom of the will, either individual or divine. Hence the central question Gatens and Lloyd see in Spinoza's *Ethics* is, how can we live without a belief in purpose?[69] This Spinozism has a certain pitiless fleshiness to it, rather than the disembodied selfhood emphasised in Mathews' account. Interestingly, individuality is conceived as more ecologically naturalised than is apparent in Mathews' explicitly ecological account, as entities are located within a uniquely perspectival system of causal relations which diminishes the impact of the "deep" ecological connection to everything. The monistic totality lies well in the background. Ultimately, the very different ends to which Gatens and Lloyd put Spinoza, and the extent to which they downplay his metaphysics, makes comparison of their work with Mathews and Naess difficult.

There is another modern commentator on Spinoza on whose work I will draw, namely Gilles Deleuze. However, Deleuze does not merely apply Spinoza's thinking to an existing domain, but instead takes up and extracts certain features of Spinoza's metaphysics in order to advance a larger project that is concerned with dynamism and the emergence of difference. I will refer to Deleuze's work in the following section as part of my evaluation of Spinoza's monism with regard to its implications for connection and disconnection, since Deleuze's position provides an interesting perspective on the nature of materialism[70].

Spinoza's substance and connection

I think there is reason to be hesitant about adopting Spinoza wholesale as *the* philosopher of connection, and my worry in this regard centres on the attraction of monism. It is noteworthy that Deleuze downplays the substance monism in his exposition of Spinoza, although I will suggest that this is consistent with his lack of engagement with Spinoza's theology, and he does replace it with a similarly problematic

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[68] Gatens & Lloyd (1999), p.28.
[69] Gatens & Lloyd (1999), p.64.
[70] See Deleuze's works *Expressionism in philosophy: Spinoza* (1990; originally 1968) (New York: Zone Books), *Spinoza: Practical philosophy* (1988b; originally 1970) (San Francisco: City Lights), and to a lesser extent *The Fold: Leibniz and the baroque* (1993; originally 1988) (Minneapolis: University of Minnesota Press).

Oneness of his own. Of the latter Deleuze says that "What is involved is no longer the affirmation of a single substance, but rather the laying out of a common plane of immanence on which all bodies, all minds, and all individuals are situated."[71] Both Deleuze and Mathews would like us to think that once we understand the reasonable and proper implications of a single substance the old worries about absolute idealist monism will dissolve, but I think Deleuze sees the implications rightly, that there *are* no reasonable implications and that substance monism can be quietly rethought – there are more interesting things than this going on in Spinoza's metaphysics, he suggests. I will now briefly look at Spinoza's view of substance to try to make sense of my hesitation, looking first at the strong sense in which Parmenides and Plato continue to speak through Spinoza's substance (the monism objection); and then second, the way in which what is most real is not an element in experience at all (the idealism objection).

The metaphysics of Parmenides and Plato are evident both in the way Spinoza accords the ultimate metaphysical principle to a singular entity, and by the alignment of the essential attributes of reality with the perceiving intellect, which allows logic to be his preferred tool for the a priori apprehension of reality. I will consider the idealistic aspect more directly in my discussion of my second concern. There are two points to make regarding the problematic nature of monism.

(a) All things follow logically from the self-sufficiency of substance, and from the infinity of God. Granted, this entity is "immanent" in a way neither the One nor the Good are, by being at the same time the stuff of the world and the unifying principle, so there is no sense in which such a superordinate being can simply be left out of the metaphysical picture to give us a materialist monism. Hence referring to "the supreme act of unification" or (more weakly) a "unifying principle" is much too Aristotelian a way to refer to Spinoza's God. What is at stake here is the presupposed fact of unification rather than any act or process by which it occurs, since it is clear that to the extent that anything *is*, it is in God, and in a prior sense, since the infinitude of substance can only ever be expressed at any one time through a finite subset of attributes. Although Parmenides in particular stresses the bounded *finitude* of the One, this is not necessarily in conflict with the infinity of Spinoza's substance-God, since the substance-

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[71] Deleuze (1988b), p.122.

God like The One is logically and conceptually prior to its expressions, and hence has an *essential* One-ness of its own.

(b) The second problematic feature of monism is God's infinitude, mentioned in the previous paragraph. When considered properly this leads to many remarkable conclusions, and one of these is that any given one of God's creatures can express only a finite subset of God's essence, leaving an infinite subset to be expressed in an infinity of other modes. Hence any given actual thing has value thanks to its relation to God, while its relations to other actual things is only via God. The catch is that since God *is* nature, it is true to say that in nature all things are connected – this is the "deep" ecological relation. This is not to deny the necessary role of other beings in the existence of any being, only to emphasise that a being is an expression of God rather than an expression of its own ecological relations, as its ecological connection is indirect. To emphasise between-being links would be to downplay Spinoza's monism.

This one-ness has immediate problematic consequences when understood on the model of an individual – it can then have characteristics of a self, including productive and receptive capacities, and can even possess a personality directed at performing certain functions for reasons largely obscure but divinable under special circumstances. All actual events and entities can be conceived as contributing their existence to the furtherance of a vastly bigger picture, which in turn, as Mathews' analysis makes clear, supports and surrounds the entities in a web of causal relations. The entities themselves are conceived as temporary encrustations of abiding influence, and to a large extent their persistence is sheeted home to their possession of an individual quantum of this quality of persistence. The relation between the whole and its parts is therefore heavily weighted towards the whole, with a fairly perfunctory understanding of the relations between the parts.

The alternative way of thinking about the connections that entities make with their environment, rather than embedding them as contingent individuals in a surrounding medium, has them as the culmination of a historical process. This genetic approach has two significant advantages for a pragmatic understanding of connection, which will be developed at greater length in subsequent chapters – first, there is no attraction in the idea of totality, since the completeness or otherwise of the present reality is the outcome of other processes, rather than the starting point for thought. Therefore connection will be necessarily partial, in the sense of some sorts of connection

being preferred over others, and dynamic, which for this purpose should convey a sense of being in transition rather than in a final state; and reality will as a consequence be open and unfinished. Second, the most prominent entities will indeed be conceivable as individuals, but properly conceived as connected in characteristic ways to other entities rather than as final, self-contained creatures. This understanding will necessarily blur the distinction I introduced when discussing the ecological mode early in this chapter, between natural-kind individuals like cats and clouds, and entities connected by virtue of the interests and capabilities of organisms, such as nested objects with path-like functions such as leaf-twig-branch-tree. Entities that qualify as "individuals" will be identifiable as particulars of interest by their historical lineage or process which culminates in them, and the unique perspective they, and they alone, have on the web of causal influence in which they find themselves the possessors of a singular point-of-view. This is not to presuppose intelligence as normally understood, but only to highlight the minimal metaphysical foundations of individuality and their possible consequences.

The second problematic aspect of Spinoza's metaphysics as a ground for connection concerns the idealistic senses in which reality is aligned with the intellect, and where what is most real is not itself an element in experience. There is a disjunct in the theoretical picture between substance and its manifestations, as Spinoza's own words above emphasise that substance *considered in itself* is not directly responsible for the causal holism of the world. The germ of a process philosophy is suggested here, since Spinoza stresses the holistic character of the background out of which diverse reality emerges. That diverse reality, however, considered in itself, is rather taken for granted, while the holistic background is in fact the unitary nature in God

(a) Knowledge about whatever is perceived is taken to be an essence which is the expression of an attribute of substance. "Expression" is here a technical term for Spinoza, highlighted by Deleuze, which conveys a hint of anthropocentrism about a certain ambiguous duality of substance - as Deleuze points out, "If the attribute necessarily relates to the intellect, this is not because it resides in the intellect, but because it is expressive and because what it expresses necessarily implies an intellect that 'perceives' it...The expressive attribute relates essence to substance and it is this

immanent relation that the intellect grasps."[72] Deleuze is here guarding against a Berkeley-style idealist interpretation of Spinoza as he contrasts emanation with immanence. The *emanative* essential relation from the One to its distinct manifestations in nature is characteristic of what I earlier termed the hierarchical metaphysic of Platonism, and also of Berkeley's idealism. It names the way the content of thought is supplied by God in response to a word being associated in the thinker's mind with sense impressions from the world. Deleuze's understanding of *immanence* is that reality flows directly from the infinite plurality of an absolutely single substance which is itself the constituent of perceiving minds and the representations therein, so that "Before all production there is thus a distinction, but this distinction is also the composition of substance itself."[73] More will be made of the role of "distinction" later in this chapter, and "expression" will be encountered more explicitly in Leibniz's account of the production of monads by God.

(b) Further, things or "bodies", the stuff of the everyday world, are the modes of substance. That is, things are modifications of substance brought about not by substance itself, but by other modifications. They do not really "emerge" or "arise out of substance", which if true would suggest a sort of proto-process which includes a kind of becoming, but rather their being is quite certain and fixed – a body or an individual thing, says Spinoza, is "a mode which expresses in a certain *determinate* manner the essence of God, in so far as he is considered as an extended thing", and is "nothing but modifications of the attributes of God, or modes by which the attributes are expressed in a *fixed and definite* manner."[74] This fixity results from the fact that God is the world and therefore all his expressions are necessary and direct, without any obfuscating intermediaries; and because the relation which binds a body's components is logically prior to the parts which constitute the mode.

The binding "relation" is a unity of particular proportions of motion and rest, while the parts form an "extensive infinity", where the infinity in question is not one of magnitude, as a number beyond all number, but rather one of indefinability, where no given number can succeed in representing the parts. This characterisation is reminiscent of the continuity of the Real numbers. The parallel is deeper, because this extensive

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[72] Deleuze (1988b), p.51.
[73] Deleuze (1990), p.182.
[74] *Ethics*, II, Def. 1, and I, 25, Corollary. (emphases added)

infinity is conceived as *limited* by the constituting relation, which reminds us that a maximum and minimum can be very "close" together while between them there will be an undefinable infinity of Real numbers. Here it is very important not to equate the so-called parts with very small things like atoms – as Deleuze puts it, somewhat obscurely, "The ultimate extensive parts are in fact the actual infinitely small parts of an infinity that is itself actual."[75] The most appropriate way to think of these parts when actualised in a body bounded by the relation of motion-and-rest is as a degree of power or intensity, which corresponds to the body's essence.

The kinds of connection discernible in Spinoza's substance and its modifications reflect the austere formality of his method. In an obvious sense, connection is barely worth talking about, since everything is God, but since God expresses infinite productivity this is not a licence to conclude that everything is the same. In a less obvious sense connection is of minimal interest, because the metaphysics on offer has no active principle apart from "expression" – the system is a purely logical one using sufficient reason to glue together two unquestioned components of reality, God and the elements of experience. And it is nothing without God. Interestingly, Deleuze seems to be an advocate for a strongly ecological Spinoza, and a brief look at his advocacy can illuminate the issues at stake. He makes a heroic but unsuccessful effort to counter a similar criticism of Spinoza from Leibniz. Leibniz, he says, made much of the impotence of Spinoza's "creatures", stripped of their "activity, dynamism, individuality, all their authentic reality. Modes were only phantasms, phantoms, fantastic projections of a single Substance."[76] Deleuze's defence seems to miss the point, as he tries to convince his reader that the very idea of the mode is in no sense a taking from creatures any power of their own, since it is "the only way of showing how things 'participate' in God's power, that is, how they are parts of divine power, but singular parts, intensive quantities or irreducible degrees."[77]

If "participation" seems a little too Platonic and serves only to reinforce the passivity of God's creatures, Deleuze has specific evidence of a more active relationship – "man's power is a part of the power or essence of God, but this only insofar as God's

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[75] Deleuze (1990), p.205.
[76] Deleuze (1990), p.226.
[77] Deleuze (1990), p.227.

essence *explicates itself* through the essence of man."[78] This might suggest that man (or any particular thing) is in a relation of *mutuality* with God, where particular things are necessary in order that God's essence be expressed; while without them, God would be in some sense diminished. This is true, but in an uninteresting way, as the infinitude of God's expressive powers must overwhelm the necessarily limited nature of any creation or class of creations. The passage cited to support Deleuze's counter to Leibniz cannot sustain the sheer activity he would like to take from Spinoza, as Deleuze's "explicates itself" is a hopeful rendition of what others translate more passively as "manifests" or "explains"[79]. Hence the essence of man, as his own essence, is a part of the essence of God, but not directly due to His infinite nature[80]. Indirectly, man's essence is his own, and is expressed as endeavouring to persist[81], which is a moderately active sense appropriate to humans, or as resistance to change (my gloss on this passage), which is a more passive sense appropriate to particular things in general.

While Spinoza's metaphysics apparently gives little comfort to those seeking an *active* participation in an ecology of particular things, it does contain a development of great interest to those trying to rethink the way things are connected. This comes in the form of the new idea of *intensity*, as uncovered by Deleuze[82], which derives from the recognition of real difference: this stems from Spinoza's appreciation that "a very great number" can refer both to the unlimited *and* the limited. Infinity of the unlimited variety occurs where parts can be abstracted from the whole (as instants or points), though they have no existence as a proper part of that whole. It occurs in the form of perfection or endlessness, or that which is unlimited by its nature, for example God; and in the form of continuity such as duration and extension, or that which is unlimited by its cause.

Spinoza's innovation is to conceive of the infinite as applicable to limitation, the limitation that makes the modes finite by contrast with substance. This too is a kind of continuity, one which cannot be characterised by any number though it can be conceived as greater or lesser, hence it has a form of indefiniteness which is distinctive

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[78] Deleuze (1990), p.227. Emphasis in the original.
[79] For "manifests" see the translation of *Ethics*, IV, Prop.4 by W.H.White used in the Encyclopedia Britannica "Great Books of the Western World" series. The Elwes translation uses "explained", which is intermediate in passivity,
[80] *Ethics*, IV, Prop.4.
[81] *Ethics*, III, Prop.7.
[82] See Martin Joughlin's "translator's note" in Deleuze (1990), Pp.416-7.

of the Real numbers[83]. It constitutes the essence of the mode, its actuality, which presents as its physical reality; and of course physical things are limited things. The modal essence is a degree of power[84], a concentration, a thickness. It allows real difference, multiplicity, to flow from the apparent sameness of the One substance, without invoking the necessity of bounds to contain it. The lack of a need to bound things is attractive, since as later discussion will disclose, bounds are characteristic of discreteness, and hence are typically invoked in support of separateness and disconnection. Next I will turn to Leibniz and the further development of an anti-Cartesian metaphysics of substance. Leibniz, it seems, indicated some sympathy for the project of connection which respects individuals, first by rejecting Cartesian dualism and the impossibility of connection between essentially disparate substances, and second by expressing his distaste for Spinoza's absolute idealism in which individuals are submerged.

Leibniz

Gottfried Leibniz, like Spinoza, was fascinated by infinity. By contrast with Spinoza's rigorous elaboration of an essential core concept, Leibniz gives us a unique vision of formal connection; an intriguing picture rather than a surgical dissection. While Spinoza exploits the infinite in order to illustrate intensity as an alternative to divisibility, Leibniz invents yet another form of infinity to illustrate density and compression as an alternative to discreteness. Spinoza's extensive infinity allows a boundless multitude of characters to flow from God's perfection, in such a way that the infinite is being divided without end. Without wishing to fall too far under the spell of Deleuze's evocative physicalist vocabulary, a Spinozan image suggests itself, of flows of material, a "plane of immanence" as Deleuze puts it; thicker here, diaphanous there, intermingling everywhere, as the modes and attributes of substance weave together to constitute the world. Leibniz conceives infinity in a new way, commensurate with the almost completely self-contained nature of his own characterisation of substance. His is an

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[83] Correspondence – Letter XII (to Meyer), 20 April 1663; and Deleuze (1988b), p.78.
[84] Deleuze (1988b), p.78. See also Hampshire's use of "energy" as a gloss; (1951) *Spinoza* (Harmondsworth: Penguin) p.71.

infinity not of endless division, but of endless insertion; not of productivity, but of bottomless depth and what mathematicians now call "compactness"[85].

The source of this depth lies in the peculiar characteristics of the monad, which is, for Leibniz, the fundamental constituent of reality. As is well known, monads are plural, not singular, but in spite of their multitude they are nevertheless unmarked by any differences - since they have no parts, they also have no extension, no form and no potential for divisibility[86]. They are conventionally presented as atoms, like the basic building blocks described by the Atomists, but this is far from their reality. In spite of being more alike than peas in a pod, every one differs from every other[87], and in spite of being as empty of character as a mirror image, they sustain all the rich variety and creativity of the world. The way they do this is especially interesting, because one classical element conspicuously missing from Leibniz' metaphysics is the crucial element previous thinkers have found absolutely necessary to explain differences of character in the experienced world - for Leibniz, there are no essences in the conventional sense.

Each monad, each simple substance, has no character of its own and is entirely self-contained, needing no other and contributing nothing to another[88] . But this is only true in the physical sense of cause and effect, force and reaction; those things which depend on extension and parthood. Besides monads, there is God, and it is God which sustains all connection. Now "sustain" is a very equivocal word, and with good reason, because it has many close relations, emphasised in the following selections: "It is very evident that created substances depend on God who *preserves* them and can *produce* them continually by a kind of *emanation* just as we produce our thoughts." Further, he is responsible for "the general system of phenomena which he finds it good to produce for the sake of *manifesting* his glory", and "he *regards* all aspects of the world in all possible manners...". When he does the latter, the result is a multiplicity of different views of the universe, each of which can become a substance, providing God "sees fit to *render* the thought effective and to produce the

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[85] Crockett (1999), "Continuity in Leibniz's mature metaphysics" *Philosophical Studies, 94*, 119-138. I will discuss this in more detail later as part of my exposition of the notion of continuity.
[86] *Monadology*, 3.
[87] *Monadology*, 9.
[88] *Discourse on Metaphysics*, XIV.

substance."[89] Hence each monad reflects the totality of the universe; it is like "an entire world and like a mirror of God, or indeed of the whole world which it portrays, each one in its own fashion; almost as the same city is variously represented according to the various situations of him who is regarding it. Thus the universe is multiplied in some sort as many times as there are substances..."[90]

The result is a kind of web of connection where every node is self-similar and yet irreducibly unique, thanks to God. The connection is not causal and is rather passive, like a roomful of people wearing mirror-shades simply looking at each other. New monads are continuously produced and inserted between existing monads, each new monad being fully-equipped with a version of reality as it exists at the moment of its creation – thereafter they remain unchanged. A monad therefore encapsulates a point-of-view, a kind of relativity which is constitutive of each subject – as Deleuze comments, this is not the kind of relativism we take for granted as being tainted by its association with subjectivity: "It is not a variation of truth according to the subject, but the condition in which the truth of a variation appears to the subject. This is the very idea of Baroque perspective"[91]. It is hard to avoid a comparison with the beautifully elaborate images of the Mandelbrot and Julia sets which so powerfully accompany descriptions of fractals, those mathematical creatures whose form repeats itself at every scale from the largest to the vanishingly smallest[92]. The nature of the connection that results from this interpenetration of perspectives casts some light on the nature of monads and on connection itself.

Monadic interaction

There are two heavily qualified senses in which substances can be said to interact: By the way they can limit each other's expressive powers; and by being involved in a composite body.

1. Limitation of expression. Although monads have no character of their own, they do have some qualities, "...otherwise they would not even be existences."

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[89] *Discourse on Metaphysics*, XIV (emphases added)
[90] *Discourse on Metaphysics*, IX.
[91] Deleuze (1993), p.20.
[92] See http://www.math.binghamton.edu/topics/mandel/ (amongst many others) for images and explanation.

says Leibniz.[93] They can undergo change, and they are constituted by manifoldness, or infinite variety. Both of these characteristics follow directly from their place as faithful mirrors of their infinite, identical compatriot monads, each of which in turn dutifully reflects its myriad counterparts – Leibniz grants that the principle which allows this change must be "internal" to each, since it is still more fundamental that monads have no external relations.[94] He calls this internal principle "appetition" to convey the way a monad's theoretical capacity to reflect everything is like a desire for perfection, which must be in fact diminished by the influence of surrounding monads. Each instantaneous unity of total reflections for a monad is a "perception", and since monads are being created continuously, perception changes continuously - it grows and dims in response to the changing influence of other monads. "Thus a substance, which is of an infinite extension in so far as it expresses all, becomes limited in proportion to its more or less perfect manner of expression ... we are able to say that *in this sense* they act upon one another, and that they, so to speak, accommodate themselves one to another."[95] Hence perception tends to be clearer and more distinct with increasing proximity – if clarity was to be perfect at all degrees of separation, says Leibniz, each monad would be a deity[96].

2. Composite bodies. All of space is filled up (is a plenum), and since everything is connected, no monad exists alone. A composite body is another name for matter, insofar as matter is "merely" a composite. Such bodies, which are ultimately composed of monads, do not gain any greater powers by virtue of their own apparent unity than simple substance alone can contribute. For example, disassembling a body in search of perceptions will be fruitless; we will find "only pieces working upon one another", but no perception[97]. This also means that aggregates have unity ascribed to them from without, by a perceiver, since "where there are only beings by aggregation, there are not even real beings, because every being by aggregation pre-supposes beings endowed with true unity ... these beings have their unity only in our minds."[98] Composites of this type would include flocks,

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[93] *Monadology*, 8.
[94] *Monadology*, 11.
[95] *Discourse on Metaphysics*, XV. Emphasis added.
[96] *Monadology*, 60.
[97] *Monadology*, 17.
[98] Letter to Arnauld, April 30, 1687.

forests and cliffs. In living organisms, however, the natural tendency of monads towards perfection and self-sufficiency, to which Leibniz gives the Aristotelian word *entelechy*, enables them to perform a unifying and teleological function for the surrounding matter, or as he puts it, "renders them, so to speak, incorporeal Automatons."[99]

Some of these incorporeal automatons have associated with them a monad with extra powers involving especially distinct perceptions, and memory with which to reflect upon them - these monads are called souls[100]. A soul, however, is subject to the same limitation on perception as other monads, it "can read in itself only what is there represented distinctly. It cannot all at once open up all its folds, because they extend to infinity."[101] Therefore the soul represents most distinctly the body which "specially pertains to it[102], and together the body and soul constitute an animal[103]. Here souls perform the individuating function assigned to essences by earlier thinkers. The body associated with a soul is "organic" because every constituent mirrors the universe; and since the aggregation of "incorporeal Automatons" is regulated with the same perfect order as characterizes the universe, organic bodies are like divine machines[104]. The individual is a concept[105] in the intelligence of God, a harmony of "local singularities", which concentrate, accumulate and coincide. The singularities, being monads, extend everywhere to infinity, but since this is via a series of mirroring monads, they are obliged to converge so as to eventually constitute the individual. [106] The highest grade of monad is a mind, capable of reflecting God – these Leibniz calls spirits. "They are capable of knowing the system of the universe, and to imitate it

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[99] *Monadology*, 18.
[100] *Monadology*, 19.
[101] *Monadology*, 61.
[102] *Monadology*, 62.
[103] *Monadology*, 63.
[104] *Monadology*, 63 & 64.
[105] The tendency to equate substances with concepts in Deleuze and other influential commentators, which is usually taken to be the mark of rationalism, and which Leibniz's own words often endorse, is not threatened by a nuanced reinterpretation of this equation in light of an early work (see Blank, 2003, "Leibniz's *De Summa Rerum* and the panlogistic interpretation of the theory of simple substances." *British Journal for the History of Philosophy, 11(2),* 261-269) Blank's conclusion is that concepts, ontologically, are ideas, and therefore *modifications* of substances.
[106] Deleuze (1993), p.63.

somewhat by means of architectonic patterns, each mind being like a small divinity in its sphere."[107]

Souls and bodies act in divine harmony even though they obey different laws - bodies acting according to efficient causation and souls according to final causation[108]. The Cartesian doctrine that allows souls to *influence* their bodies is therefore denied, as all the influence required can be supplied by God in the form of pre-established harmony[109]. Curiously, however, this harmony does depend on an especially intertwined genetic relation between the soul and its body, even though there is no fixed quantity of matter permanently associated with a soul as all bodies are in flux. This genetic relationship starts before conception, according to the doctrine of preformationism that was influential at the time[110], and survives what we call death. This lends to bodies the immortality due to souls by virtue of their reflection of the indestructible universe.[111] These interactions of restriction and composition are quite nugatory and far from any sort of metaphysical ecology. It is necessary to further consider the implications for connection of the holism suggested by the relations between monads, and whether this has relevance for the question of connection in general.

Monadic connection

Three kinds of connection emerge from Leibniz's monadology: reflective, hierarchical, and formal. All will turn out to be intimately bound up with Leibniz' methodology, and the central role played in it by the Principle of Sufficient Reason. Metaphysical Rationalists believe that everything occurs for a reason, and for them a reason is a creature neither physical nor mental. The acts of God are at the same time the supreme reasons; this is why Deleuze's term "expression" is such an apt word for the work God does, since it so concisely conveys action, thought and creativity together. So when Leibniz says that "God does nothing out of order..." it is almost unnecessary for him to continue "... This is so true that not only does nothing occur in this world which is

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[107] *Monadology*, 83.
[108] *Monadology*, 79.
[109] *Monadology*, 78.
[110] See Sloan (2002). "Preforming the categories: Eighteenth-century generation theory and the biological roots of Kant's a priori." *Journal of the History of Philosophy, 40 (2)*, 229-253. Sloan's focus is on the influence of the preformationist doctrine on Kant.

absolutely irregular, but it is even impossible to conceive of such an occurrence."[112] I will now clarify what each of the three modes of connection entails.

1. *Reflective connection* names the infinite mirroring of every monad in every other monad, with due allowance for diminishing clarity with increasing distance. In this way a society of individuals is at the same time a society in which everything is connected. This is a relationship which depends on the active principle, appetition, considered as a movement towards perfection, or a reaching out towards infinity. As reflection, the relation is a mutuality, but not just the mutuality of the object+image paired by a standard mirror, rather the endless repetition of images which tends to darkness when mirrors face each other. Into this darkening series an infinite number of monads can be inserted by God in an infinite number of locations, each one of which reflects the "same" series from a different point. Hence the fractal image introduced earlier, and the metaphor of bottomless depth. The series, which ramifies infinitely at every term, describes neither a line nor a surface nor yet a solidity, since every term which *could* be a determinate structure were it to be the final term, is immediately elaborated. Deleuze gives as an example the fractal image called Koch's curve, formed by progressively rounding angles – "The curve passes through an infinite number of angular points and never admits a tangent at any of these points. It envelops an *infinitely cavernous or porous world*, constituting more than a line and less than a surface."[113] Since its dimension is somewhere between a line (dimension = 0) and a surface (dimension = 1), it has a fractional dimension, alias "fractal". This is connection of a sort, since nothing escapes reflection and everything so reflected differs from its neighbours by infinitesimal degrees that together constitute continuity. All is the same, yet each differs. Another way to think of this form of connection is to consider the "closeness" of relation – there is a peculiar intimacy to the monadic relations, where each is not quite identical to its fellows (where the degree of difference would be zero), yet each fails to be significantly different (where the degree of difference would be 1). Again, the closeness falls between 0 and 1. Yet this kind of connection is at base an illusion, since those reflected have no relation to each other apart from the place each takes in the infinite

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[111] *Monadology*, 71-74.
[112] *Discourse on Metaphysics*, VI.
[113] Deleuze (1993), p.16 (emphasis added).

series God spins out endlessly. Their relations are set for all time at the moment of their creation.

2. *Hierarchical connection* emerges from the natural variation in the range of powers attributed to monads in association with bodies. Nicholas Rescher notes that Leibniz viewed nature as a nested hierarchy of functional complexity that began and ended with metaphysics[114]. The increasing powers of monads considered as entelechy, soul and spirit constitute a kind of hierarchy of authority or chain of command, even though no actual commanding is done by the dominant monad at each level. The authority results from the greater perfection and clearer perception of the dominant monad compared with the other monads at its functional level, rather than any outright unifying function this monad performs directly. Rescher means "nested" to suggest a form of relation in which each level is *subsumed* by the next higher level, and in which the nesting relation is complemented by the containment relation (Levels 1a and 1b *nest* within Level 2, while Level 2 *contains* Levels 1a and 1b).

The monadic hierarchy, however, does not exhibit this complementarity between nesting and containment, and is therefore asymmetric – it is considerably easier to conceive of the organic body from the top down, as it were, than from the bottom up. Monadically speaking, each level of complexity can be disaggregated into its organs, and they in turn into tissues (the conventional anatomical hierarchy as we now know it), each of which is unified by virtue of the limit of its perceptive clarity, rather than by its own interconnected relations. The coincidence between the unified region of monads and any organic boundary must therefore be contingent rather than necessary; this equation is a descriptive move on Leibniz's part rather than a systematic outcome of his metaphysics. Hence the *disaggregation* of a body can indeed proceed by searching out especially perceptive monads (my language is of course appropriate only to a thought experiment) and isolating their region of clarity, but this process is not reversible. From the other direction, from the bottom up, one is presented with body-monads, among which are the entelechy-rich – but from this perspective all are equal, since there is no structure when looking up the hierarchy. In

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[114] Rescher (2001), *G.W.Leibniz's Monadology: An edition for students*. (Pittsburgh: University of Pittsburgh Press), p.225.

the final analysis, then, the unity of a bodily organ such as the heart owes everything to God and nothing to the constituent monads themselves.

3. *Formal connection.* Leibniz illustrates the impossibility of breaking out of the benevolent straightjacket of reason by asking the reader to imagine a number of dots marked any which way on a sheet of paper, presumably placed according to the reader's free will or even "randomly" – it is possible, he says, to find a geometrical line, a "uniform and constant" function, which passes through all the points in the order they were drawn[115]. This seems like a triumph of drawing-room mathematics only, until the realisation dawns that our three-dimensional reality is completely full of such points, and *every conceivable subset* of them is capable of being connected by a uniform and constant function. Material reality is indeed composed of functions!

Most interestingly, however, this vision of regularity and suggestive determinacy has its complement, irregularity and indeterminacy. In a letter to Arnauld (September 1687) Leibniz says "there can never be 'a straight line without curves intermingled,' nor any 'curve of a certain finite nature unmixed with some other, and in small parts as well as large,' such that one 'will never be able to fix upon a certain precise surface in a body as one might if there were atoms.'"[116] This is not a problem for God, of course, who is the source of the hidden regularity that only seems irregular to our limited senses. Just as an artless arrangement of points can be shown to reveal a formal regularity, so too can a straight line be reconceived as a single tangent which connects disparate curves, and a curve be revealed as the outcome of the mixing of other curves. However, in spite of the formal regularity and the appearance of continuity it presents, we must remember that monads are nevertheless singular things in continuous creation, so their actual relationship cannot present itself as a unity. Unlike an ontology which bottoms out at atoms, as Leibniz points out above, any subdivision of the lines will proceed to infinity, so there will not be a definite stopping point which would serve to characterise a "surface".[117]

Ultimately all these types of connection reduce to formal connection, as all the unity required can be found in a single monad, "since true substances are so many expressions of the whole universe taken in a certain sense and so many reduplications

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[115] *Discourse on Metaphysics*, VI.
[116] Quoted by Deleuze (1993), p.14.
[117] See also Letter to Arnaud, April 30, 1687.

of the divine work"[118]. The true unity, Leibniz says, is only to be found in "complete beings … in which different states succeed"[119]. Objects in general are merely nominal aggregations of substances which the superficiality of appearance or the demands of convention allow to be unified in thought by making one name stand for the aggregate, "which name shall serve as a means for reasoning"[120]. Even causal relations, which give a compelling appearance of unity to objects, must be denied, and although the monadology has more of a story to tell about the creatures of appearance than Spinoza's substance-god, it is in the final account only as the constituents of conventional reality.

2.4 Substance and disconnection

Substance is the most real, the anchor-point for being-in-the-world. Its attraction for proponents has been its permanence and versatility – it can be anything and is implicated in everything. It is no longer no-thing, but is not quite yet some-thing, and its attraction for metaphysicians is therefore that its thingly quality is logically and conceptually prior to the actual things of the material world. By bringing together in substance the previously disconnected aspects of material constitution and intelligibility, Aristotle narrowed the gap between creatures, since matter was now an irreducible element of their being and their form was at least shared with related creatures. The combination of form and matter has an inner energy resulting in beings that act, and their activity is an expression of their individual natures, though it is their essence which makes them what they are. The combination of perceptual immediacy and essential definition results in clarity of experience for normal, socialised people. The cost is a persisting belief in the necessary separateness and self-sufficiency of the objects of experience, but a moment's reflection on the nature of substance can be sufficient to counter this.

In the work of later innovators the intimacy of the connection between constitution and intelligibility in substance is lost. By separating the two and placing them side by side Spinoza achieves unity only in God's nature, while in making the two so closely identified as to be one thing Leibniz reduces everything to the formal

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[118] Letter to Arnaud, April 30, 1687.
[119] Ibid.
[120] Letter to Arnaud, April 30, 1687.

unity of God. Both developments result in the loss of substance's active principle, or its inner power, and it tends towards an inertness that culminates in modern materialism. After Kant there is matter, there is reason, and there are transcendental objects, like God, to be connected in complex architectonic structures that are to become the proper subject matter of metaphysics. Until Kant signals the end of the aspirations of rationalist metaphysicians and their alignment of the infinite with the understanding, God increasingly becomes the supplier of worldly activity, but not directly. Spinoza allows the productive divisibility of the infinite, which expresses God, to drive the production of dynamic reality. Leibniz finds it necessary to give the monads an analogue of "life", an urge to perfection, which is a limitation of the expression of God's perfection. These "god-given" elements, expressed as intensity and density, realise the inner nature of substance as act, and go some way to resurrecting the unity thought by Aristotle. Together they provide some resources for considering an individual as a thickening or intensification of surrounding flows of material, and as not essentially differing from that material except insofar as the local concentration must have a focus, or centre. Hence they provide alternatives to the notion that an individual must be bounded and discrete, two concepts I will consider in more detail in the following chapter.

The conclusion of this chapter is that substance no longer has the right kinds of characteristics to sustain connection. It is a critical component in any metaphysic of discreteness because it is the very discreteness of the everyday which is its task to explain. Rationalist systems of metaphysics that align reality with the expressive power of God allow a subtle understanding of how part-whole relations result from divisions within the real, but these divisions remain tightly bound to the pre-metaphysical understanding of individual identity, and any teleological powers they exert remains subservient to the unifying role of such a god. Dissolution of the notion of substance, to be commenced in the next chapter, will be literal, and this has already been hinted at – substance itself allows that individual boundedness can become permeable, and that the divisions of the real can leak and blend with the real divisions of other entities. Chapter Three will therefore investigate the implications for connection of these weakenings of substance's grip, while Chapter Four will look at examples of philosophical positions which have a liberal understanding of substantiality and discreteness, in the direction of a strengthened understanding of

connection. A final element in substance's dissolution has not yet been canvassed. This is that these features which are constitutive of dissolution are *actions*, and as such they are temporal beings which are happenings. This vital element will bring the potential for change and the production of the new occurring in duration to what was once substance. This deconstruction of substance has occurred before, in the guise of process philosophy, so Chapter Five will pay some attention to process and other attempts to reintroduce continuity to metaphysics.

Chapter Three – Discreteness, Continuity and In-discreteness

This chapter will give an explicit account of a family of concepts that are presupposed by the structural solutions to the nature of reality surveyed in the previous chapter. The role of essence and substance in grounding connection and disconnection was cashed out, negatively at least, in terms of the association of these "most real" things with the notion of discreteness. The two fundamental aspects of reality, its constitution and its intelligibility, were found to be most supportive of connection when at their most tightly integrated – notably in Aristotle's formulation of substance as a principle of structure. This chapter will look in more detail at a core element of structure; the extent to which it is discrete or continuous.

This dimension of discreteness-continuity is prior to any structure in two ways which reflect the constitution-intelligibility distinction. For one, an assumption about the prior necessity for discreteness or continuity can be seen operating as an intuition about the very possibility of the intelligibility of something; typically the assumption is that discreteness is a necessary condition for intelligibility. This can be seen in an extreme form in Parmenides' dictum that "It must BE totally or not at all", and in a much less extreme form in Aristotle's frequent comments about the nature of his project in the *Metaphysics*, for example "…all that 'is' is related to one central point, one definite kind of thing, and is not said to 'be' by a mere ambiguity."[121] A second form of priority concerns the nature of the proposed structures themselves – the fact that their constitution depends on their discreteness or continuity in a gross, strongly determinative fashion (in other words, discreteness or continuity is said to be constitutive of a structure). On this understanding of priority it is a priori, so to speak, that a discrete structure will be radically different from a structure informed by continuity. This chapter will argue that while continuity is a productive presupposition for intelligibility it cannot operate as prior in structure because it is not a concept capable of underwriting any useful structure. However an approximation to continuity, I suggest, is a productive concept when investigating structure, and I call this approximation *in-discreteness*. To recognise the structural priority of the discrete-continuous-in-discrete

[121] *Metaphysics*, Γ.1003a33-4.

family of concepts I will call them *proto-structural*, since they are seen to operate as conditions for the possibility of any structure at all.

This chapter will now look in more detail at the internal characteristics of connection and non-connection. It will do this by investigating the core proto-structural feature of objecthood that underpins non-connection, discreteness, and its contrast term which is constitutive of connection, continuity. It will become apparent that continuity in itself is of limited metaphysical utility in sustaining connection, but a reworking of the antagonistic relation between discreteness and continuity, which I have termed in-discreteness, can result in a more suitable grounding for connection. I start with the nature of discreteness, then will have a detailed look at some of the implications of a discrete metaphysic and what current alternatives to it offer. The examples will come mostly from cognitive science, a discipline in which an unacknowledged battle against discreteness has raged for decades. This will prepare the way for a discussion of continuity and my suggested compromise between discreteness and continuity, in-discreteness.

3.1 Discreteness

In the opening section of this work I considered the nature of the relation between appearance and reality, and I proposed that the dominant way of conceiving of this relation was as no-relation; that in fact connection between the two was deemed to be blocked. A related proposition was that a similar blocking of connection occurs in the usual ways of thinking about the world, where the special nature of subjectivity lends the internality of thought some qualities which by definition cannot be shared with the world. In both situations it is perhaps closer to the mark to think of the relation between the two metaphysical entities (appearance/reality; thought/world) as being dominated by the apparently self-evident nature of their existence *as* entities – this would result in a barrier to connection being considered rather as a lack of connection, or a gap resulting from the absence of common characteristics. The idea of a gap tallies nicely with the idea that on that dominant view each metaphysical realm is taken to be bounded, and such a bounding is regarded by me as a problem.

Something which is *discrete* keeps itself to itself. This is equally true of a person (“discreet”) and an inanimate object. It is the “keeping to itself” that matters, and

which makes an object that object rather than an arbitrarily labelled piece of some other object. It is separate from other things, not apparently connected to them. Hence it may be that the question of connection cannot be divorced from the question of thingliness, and that it may seem that the definiteness with which an object is said to exist is inversely proportional to the degree to which it is connected to its surroundings. A strong desire to avoid this trade-off appears to dominate the conception of autopoiesis – a concept that is given more detailed consideration below (see the discussion at the end of this section on discreteness). Two possibilities for the implementation of a trade-off between objecthood and connection suggest themselves here: a Hegelian view of a unity which finds part of its power concentrated into a single entity, draining power away from the remainder of the unity to result in a Thing– No-thing duality[122]; or a Spinozan view of relational existence, where on the contrary the intensification of power in the Thing is reflective of the *increased* powers of its surrounds, not their diminution. In neither case can discreteness and connection be divorced, but this "connected" way may not be the best way to get to grips with discreteness. A third option is to consider the characteristics of discreteness by itself; discretely, as it were; and I will begin with this. The remaining two options for considering discreteness will turn out to be heavily dependent on the presupposing of a kind of unity, which means that they are themselves outcomes of a certain discrete-ised thinking.

Simple discreteness

The kind of unity presupposed by the notion of discreteness is the unity of a singular thing; the commonsense or everyday idea of a unity being a one-ness. Aristotle's logic represents the acme of commonsense by formalising this view of unity into what has become known as the "laws of thought":

1. The law of identity: "Whatever is, is."
2. The law of non-contradiction: "Nothing can both be and not be."
3. The law of excluded middle: "Everything must either be or not be."[123]

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[122] Thanks to Anna Lehrbaum, Notre Dame University, Fremantle, whose paper "Logic and conflict" at the 2004 AAP Conference, South Molle Island, alerted me to the distinction between antagonism and conflict, and the possibilities of a Hegelian analysis of discreteness.

[123] Russell (1912), *The problems of philosophy*, (Oxford: OUP). p.40.

The cumulative effect of these mutually supportive dictums is a world of discrete entities. A discrete entity need not have an interior which is a simple unity of total sameness. Aristotle's substances, to which these laws of thought were to be applied, include composites whose parts may also have a principle of structure, such as living bodies and their organs. They are subordinate, however, to a more encompassing unity, particularly one with the power of self-movement. Its interior entities of a unity can be conceived as ranked or ordered according to their degree of fit with the overall entity, though this obviously is more applicable to a composite such as a series of numbers or a set with a variety of members. A bound is a determinate place in the internal ordering of an entity, within which the entity is said TO BE (ie, its components are similar *enough*), and beyond which it is said NOT TO BE (ie, they are now *too* different). In this respect an entity such as a category can also be regarded as a discrete object which is subject to the identity-firming power of non-contradiction. Here is an example of the category "five" containing only instances of numbers greater-than-or-equal to five and less-than six.

A set of categories constitutes a series of objects, and since the bound constitutes the "surface" of an entity, two entities in this series can do no more than touch – they are said to be "mutually exclusive". The next category after "five" has a membership rule that complements "five" – it contains only numbers greater-than-or-equal to six. There is no overlap[124]. Aristotle spells out the nature of this bound in the *Metaphysics* when he discusses differences – he conceives of the category as consisting of entities ordered by their possession of the characteristic in question:

> But surely that which is greatest in each class is complete. For that is greatest which cannot be exceeded, and that is complete beyond which nothing can be found. For the complete difference marks the end of a series (just as the

[124] However there is a complication in the case of numbers of a particular kind, the real numbers, which I will discuss later in this chapter as an example of continuity. The way the categories are defined in the example would result in the upper and lower bounds having slightly different natures,

> other things which are called complete are so-called because they have attained an end), and beyond the end there is nothing; for in everything it is the extreme and includes all else and therefore there is nothing beyond the end, and the complete needs nothing further.[125].

Here, the crucial and fundamental aspect of bounding is the completeness of the class – anything other than a bound would allow this completeness to be potentially violated, which would threaten the supposed determinateness and definiteness with which the class can be known.

Simple discreteness has much in common with full-blooded atomism – each demands that an object have a fully inviolate boundary, and that its creation and destruction be marked by complete transmission of causal powers from and to its predecessor and successor objects. Putting it another way, objects should not leak or otherwise promiscuously mingle with their surroundings. Their boundary must be impermeable. This makes discreteness very attractive as a basis for the symbols which some hold to be constitutive of mental representations. Defenders of this view, such as the cognitive scientists Eric Dietrich and Arthur Markman, find a compelling equation between the subjectively-experienced precision of thought and the necessity for the representational content of thought to be similarly precise. This compulsion will be discussed in a larger context later in this chapter, the context being cognitive science in general. Dietrich and Markman locate their view of discreteness against a conception of continuity, of which more later. Hence they insist that mental content must be discrete because continuous representations cannot do the following: Discriminate, combine, sustain internal structure, or be independent of worldly covariation[126]. Combination with other symbols, and conversely, decomposition of complex symbols, is of prime importance and brings with it further requirements which illustrate discreteness - "It might seem that being a discrete composable entity follows directly from being an enduring representational entity, but not all enduring mediating states make *finite*, *localizable*, and *precise* contributions to larger states."[127]

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[125] *Metaphysics*, I. 1055a10-17.
[126] Dietrich & Markman (2003), "Discrete thoughts: Why cognition must use discrete representations." *Mind & Language, 18 (1)*, 95-119. p.105.
[127] Markman and Dietrich (2000), "In defense of representation." *Cognitive Psychology 40,* 138–171. p.149. Emphasis added.

It is only a short distance from believing that thought must be discrete because that is how thought works best, to believing that thought must be discrete because that is how the world works. While an adherence to the concept of representation, which though dominant is being contested, does not commit one to a belief in *discrete* representations, a belief in symbolic representation certainly does. Cognitive science is a very diverse area, but it owes its origins to the relatively unified efforts of a number of disciplines driven by a reductive research programme which sought to explain the generation of high-level functions from low-level processes; these disciplines included cognitive psychologists with input-output engineering models of the mind, computer scientists interested in artificial intelligence, linguists interested in the constructive powers of syntax, neuroscientists who were increasingly discovering highly-specific modules for low-level processes, and philosophers interested in the nature of language. The focus on a reductive-constructive paradigm explains the interest in representations which can combine and decompose algorithmically. Interestingly, most alternatives to the dominant symbol-processing paradigm require a less self-contained brain to engage more fully with its surroundings, where those surroundings are defined variously as body, culture, or environment. That is, the alternatives to symbolism tend to claim a great deal more connection with other significant entities than the dominant paradigm would allow, and this in some quarters is allied with a critique of symbolism. Some of these issues are investigated later in the present chapter, so for now, I want only to reiterate that the deep philosophical buttressing of a belief in the necessity for discreteness, which I addressed generally in Chapter One, is reflected in a number of applied areas of research which do not readily draw on philosophical support for their positions. Next I will look at the two other ways of characterizing discreteness, which place it in relation to other entities.

Relational discreteness – dialectical unity

A unity with an otherwise undifferentiated interior may respond to external force in two broad ways: It may remain undifferentiated, and stolidly persist in being that thing, or it may change, to concentrate its resources so as to bring to prominence a previously minor component which comes to dominate the unity. In both cases we should be wary of accepting at face value the ascription of unvarying sameness to the unity – in these

cases, "undifferentiated" means that whatever differences there are simply do not matter for the current state of the unity. But differences there will be. The Aristotelian idea of identity as self-identity allows for internal differentiation within composite substances, but differences are subordinated to the identity conferred by substance. The alternative, of a unity changing to a new configuration, was considered by Hegel as an example of self-contradiction[128].

Self-contradiction is a dynamic process, in stark contrast to the fixity of self-identity (but bearing in mind the dynamism of the really real, which is inherent in Aristotle's view of substance). Some element of the internal differentiation which previously played no part in defining the unity is called into prominence by the particular circumstances; conceptually, you might call this a path to something having "meaning", as something of the prior unity now becomes distinctive of that unity. Hegel calls the logical principle that "the negative is just as much positive" a "quite *simple* insight". By this he means that there was already a capability in the thing to become something different, but it does so as a process rather than an instantaneous recognition of something already present:

> … what is self-contradictory does not resolve itself into a nullity, into abstract nothingness, but essentially only into the negation of its *particular* content, in other words, that such a negation is not all and every negation but the negation of a specific subject matter which resolves itself, and consequently is a specific negation, and therefore the result essentially contains that from which it results; which strictly speaking is a tautology, for otherwise it would be an immediacy, not a result. Because the result, the negation, is a *specific* negation, it has *content*. It is a fresh Notion but higher and richer than its predecessor; for it is richer by the negation or opposite of the latter, [and] therefore contains it, but also something more, and is the unity of itself and its opposite.[129]

This new "thing" is indeed a discrete thing in that it has a distinct thingliness, but it is not discrete in a separable way, because it is intimately, constitutively, bound to its context. However by the standards of identity the thing clearly has achieved separate

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[128] Lehrbaum (2004).

being – it is, considered in isolation, nothing but itself, and nothing of its essential nature is shared with any other. The space of the prior unity is now divided without remainder into Thing – Non-thing, and the relations which characterise it are now internal to that unity, rather than being the external relations which inevitably must act between atomic, discrete entities. The internality of relations is complemented by what could be called the movement towards self-determination, shared with all living things[130], as the thing (in Hegel's system, a pure concept) brings itself to reality.

The apparent dynamism of this process is perhaps its biggest weakness – there seems to be no reason for the new configuration to persist more than fleetingly, without an accompanying story about how some configurations can attain greater permanence than others. It is consistent with postulating a metaphysic of self-determination that something akin to self-maintenance, a kind of autopoietic independence, is plausible. The most significant aspect of this kind of dialectic discreteness is that it exists in the realm of thought, albeit thought imbued with more metaphysical muscle than most writers of a non-idealist bent would allow, and in this kind of ecology relative impermanence is not a drawback. For thought as conceived in this way, the dialectic provides an indissoluble unity between the form and the content of thought, thus achieving an advance of sorts over Kant[131], and an advance over simple atomism. This last is the only thing I want to take from the discussion, as any more would be beyond my scope.

Relational discreteness – modal intensity

As I discussed in Chapter Two, Spinoza's conception of God's infinitude results in reality which is a metaphysical One while also being an ontological Many. Such individuals as there are can be apprehended by reason as an intensification or thickening of the finite modes, as their power depends positively upon the strength of their relations with other "individuals", rather than negatively by taking power from them. It is also clear, however, that the discreteness and clarity with which individuals are perceived owes much to the rational powers of the perceiver, since there is no story to be told

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[129] G.W.F. Hegel, *The Science of Logic* [online], § 62. Quoted in Lehrbaum.
[130] De Boer (2004), "The dissolving force of the concept: Hegel's ontological logic." *The Review of Metaphysics, 57 (4)*, 787-822. p.807.
[131] De Boer, p.792. See p.802 for Hegel on the independence of concepts from any worldly considerations.

about how individuals can have any kind of existence independent of their constitutive substance, which is God. Hence to the usual ways of dividing up the philosophical pie this looks like an epistemic view of discreteness rather than an ontological one. Nothing is genuinely separate from God in Spinoza's metaphysics, in spite of the efforts of commentators such as Deleuze to downplay the super-normal attributes of God by stressing the "plane of immanence" on which His works are laid out.

Instead of conferring unity on an entity, essence just is the effort made to maintain unity in the face of pressures towards dissolution, an effort which will be relatively more or less successful rather than absolutely so. As a consequence it serves no purpose to insist on the inviolability of a creature's boundary in a relational metaphysic, since this will be just as much a contested region of its being as its deep interior, and to a large extent relations which maintain and build will be roughly balanced by relations which ablate and diminish. Regardless, therefore, of the reality of creatures, it seems clear that their status as "creatures" is far from stand-alone discreteness. This was the attraction of a relational metaphysic – it means that some relations will be fully 'internal' to the creature, some will be fully 'external', and many will reach across what is conventionally taken to be its boundary. The creature struggles to separate itself from its surrounds, and it struggles always in vain, since the only true unity is God. The partial unity which results is of interest, however, because it represents something which is neither discreteness nor its complement, continuity. Although the connection which this partial unity is indicative of is rendered insignificant by the all-encompassing monism, it would be significant in a pluralist metaphysic. This will become more apparent later in this chapter.

Autopoiesis and cognition – a case of a necessary boundary?

How discrete is the kind of boundary which the surface of a self-maintaining organism represents? *Autopoiesis* was invented by Humberto Maturana as a term to replace "circular organization", which had itself resulted from an appreciation that feedback and recursive processes in general were the core contributors to biological unity. The central concept both terms were trying to capture was *autonomy*[132], and in making the self-

[132] Maturana (1980), "Introduction." In Humberto Maturana & Francisco Varela (Eds.) *Autopoiesis and cognition: The realization of the living*. (pp.xi-xxx) (Dordrecht: D.Reidel)..p.xvii.

maintenance of autonomy a central issue for biology and cognition, Maturana and his collaborator Francisco Varela were also addressing the key metaphysical issues of identity and teleology. An autonomous system is to some extent a closed system, and we will see later in this chapter that this is a potentially problematic insight when instantiated in its strongest form in cognitive science. The autonomy in question, however, is analysed largely from the perspective of the structural relationships among components, rather than the necessary limiting effect of the system's boundary. Living systems are machines, say Maturana and Varela, and machines are defined by their organization, rather than by their components[133]. Self-maintenance primarily addresses its activities to the relations between components, while replacement and renewal of the components themselves will only take place within this larger context. Since the boundary marking the outside of one organism and conferring discreteness upon it is only one component among many, there is apparently nothing special about such a boundary.

However, there is every reason to think that the boundary is a very significant feature of an autopoietic system. This is not because a boundary is primarily a feature of an *autonomous* machine, since autonomy results from subordinating all functions to that of self-maintenance, regardless of how this is to be achieved; and it is not because such machines have *individuality*, since their identity results from the activity of self-maintenance[134]. It is because such machines are *unities*, which result from their operations specifying their own boundaries. This kind of boundary is conceived as impermeable, since such machines do not have inputs or outputs but instead are buffeted by "perturbations" from independent events[135]. This makes it clear that autopoiesis is being primarily defined by the character of *independence* from other entities, and here independence is a much more precise concept than autonomy; and to the extent that perturbations do not threaten this independence they can be considered as inputs or outputs. Independence is therefore an all-or-nothing concept, a categorical state which is constantly under threat – "If the subordination of all changes in a living system to the maintenance of its autopoietic organization did not take place…it would lose that aspect

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[133] Maturana & Varela (1980), "Autopoiesis: The organization of the living." In Maturana & Varela (Eds.) pp.63-134. p.76.
[134] Maturana & Varela (1980), p.80.
[135] Maturana & Varela (1980), p.81.

of its organization which defines it as a unity, and hence it would collapse."[136] This catastrophic view of the consequences of dis-unity seems to be an expression of discrete thinking of a type I described above as dialectical.

Discreteness has been presented so far as a concept in its own right, and in terms of some distinct applications in which the necessity for discreteness has been explicit even though the concept itself has not been. The following section will attempt to make the shortcomings of discrete thinking manifest, and to prepare the way for the presentation of alternatives to discreteness that follow. This will be the last direct examination of the concept of discreteness in this work.

3.2 Problems of discreteness

In the previous chapter I considered some aspects of historical attempts to understand the metaphysical issues of constitution and intelligibility. Three significant solutions were the concepts of being, essence and substance, and each seemed to be a consequence of an implicit commitment to discreteness. Some of the shortcomings of each were detailed, but only at the very general level of metaphysics. In this section I will consider what the effects on more applied work of having this metaphysical commitment to a proto-structural concept might be. Broadly, my contention is that the presumption of identity and self-sufficiency for the entities invoked in systematic thought has resulted in systems comprised of separate fixed components connected by separate relational components. Discreteness, the following discussion suggests, does not ultimately have the proto-structural resources to enable productive thinking about connection.

Aristotle opens his investigations in the *Metaphysics* by noting that "All men by nature desire to know." His account links sensations to the gaining of experience, and thence to the systematic structuring of experiences we call wisdom. We progress from a cultivation of our experiences to the knowledge of why those experiences are the way they are, and classically this was understood as a development from knowledge of particulars to knowledge of universals. His own solution attempts to maintain a careful balance between thinker, thought and object, such that elements of constitution and

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[136] Maturana & Varela (1980), p.87.

intelligibility are blended in the object, while elements of subjectivity and inter-subjectivity are blended in the nature of experience and what it is to know. While constituent elements can be teased apart conceptually, in reality they are interdependent. Almost all philosophy, and the sciences that developed from philosophy, has been more concerned with conceptual separation as a route to knowledge than with a nuanced understanding of how the separable elements blend in nature.

My suggestion, which it would be the work of another thesis properly to argue for, is that when that nuanced understanding of blended reality is subordinate to conceptual separation as the true path to knowledge, discreteness assumes a prominent role in structuring knowledge. Two sources of pressure result in discrete thinking, and I introduced both in the opening sections of Chapter One; they are the intuitive separation between the thinker and the world, and the immediate perceptual separation between objects in the world. To regard either of these as somehow primary is to commence on a path of disconnection. For instance, presuming the separation between objects to be a foundational fact about the world will be most problematic for a theory of truth which is based on bivalent truth values, since it will depend upon there being a determinate fact-of-the-matter about whether statements are either True or False; that is, that there be actual, unambiguous things in the world which map onto, or make, such statements one or the other. Not only current, present-tense statements are bound by this realism with regard to truth, but more strangely there are expected to be future states, expressed as counterfactuals, which must be determinately either True or False[137]. The notion of knowledge depends in part on Truth, and also on subject-object separation – that nothing can be known unless that "thing" can be distinguished from thoughts about the thing, and it cannot be known with certainty unless those thoughts are true. Two "theses" of separation therefore suggest themselves (by "separation" I mean that whatever commonalities entities appear to have are presumed to be irrelevant when it comes to what is most real – in the terminology I will be increasingly using I would say that such entities are presumed to be discrete):

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[137] See in this regard Michael Dummett (1991), *The Logical Basis of Metaphysics*, (Cambridge, MA: Harvard), particularly Ch.15, "Realism and the theory of meaning". I discuss counterfactual accounts of causation in the final chapter, though the temporal focus of concern there is on the past, not the future.

> (1) *World-Body separation*: Representations of the world are separable from the physical body and its actions; and, related to this; manipulation of knowledge is separable from embodied agentivity.
>
> (2) *World-World separation*: Atomic elements of knowledge are separable from each other and the world;

These theses are not independent as thesis (1) seems to be conceptually prior to thesis (2), but the formulation given here is, in any case, somewhat simplistic, and I do not intend either to treat these theses in any more detailed fashion, nor to provide any direct argument for them. The point of introducing them is so that they can be used to draw out examples of the way discrete thinking has permeated the analysis of thinking in general. I will use the analysis of perception as an example of the conjunction of the theses in order to pursue a deeper investigation into some of the problems that arise when discreteness is assumed. Perception sits at a kind of metaphysical crossroads in philosophy, as it is a contested ground where theories of appearance and reality, knowledge and truth, subjectivity and objectivity collide. Actually it is likely that a similar description could be made of any area within philosophy. For example, Gatens and Lloyd's application of Spinoza to collective behaviour uses metaphysics to better understand the meeting of ethics and politics. One significant hurdle Spinoza helps them overcome is an ethical atomism, where "our understanding of responsibility is restrained by thinking of individuals as bordered territories, firmly separated from others in such a way that the issue of where responsibility lies is always in principle determinable."[138] Spinoza encourages a rethinking of the nature of this atomism, to move away from the discreteness of the "bordered territories" and towards a sociality marked by less individually determinable responsibilities. Although my discussion of the impact of the Separation Theses will make use of different kinds of analyses, there will be a depressing degree of overlap between them as it becomes clear that workers in widely differing disciplines have failed to appreciate the drawbacks of discrete thinking.

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[138] Gatens & Lloyd (1999), p.74.

Perception and disconnection

Why is separability a problem? I will consider the general concept first, then consider the specific problems resulting from the separability thesis later. Clearly separability hasn't necessarily been regarded as a problem by previous writers on perception, so why is it a problem now? One obvious answer is that the basis of our subjectivity has been taken for granted – it is just a brute fact that I am a unique being distinct from my surroundings. Further, most religious traditions go on to emphasise that my uniqueness is underpinned by my possession of a rational soul or an equivalent essence, a non-physical individuating substance which will survive my death. On this view, separability is just constitutive of the perceptual process and is to be explained rather than denied, so overcoming it will be a side-effect of a deeper understanding of perception.

The problems of separability outlined above are nurtured by this comforting view of subjectivity. If the self is encapsulated in the body and separated from the world, then for it to *know* about the world requires a translation from one realm to the other - between physical features in the world and mental features in the mind. Hence atomic elements of knowledge must be teased out of the world and separated from each other in order to be available to the mental realm in the atomic form of a symbol (World-World separation); representations of the world must be separated from the physical body and its actions in order to be represented in the mental realm (World-Body separation); and symbolic manipulation of knowledge must be separated from embodied agency as they have essentially different requirements for interacting with the world (World-Body separation). These problems can be summarised by saying that there is a fundamental distinction between physical and symbolic components; and the emphasis placed on the agent tends to ignore the constitutive role of the supposedly external world in creating and channelling agency. In the following chapters the interconnectedness of the physical and the symbolic, and of the "external" and "internal", will be presented as a holism which is inextricably implicated in the project of in-discreteness.

A self-evident distinction between subjectivity and objectivity has resulted in arguments which purport to overcome the various separations outlined above. Descartes sidestepped the issue by acknowledging the separate ontological importance of his body and mind, but resorted to a dubious appeal to anatomy to allow them some connection. Berkeley explained the problems away by proposing that none of the interesting features

of the world were actually *in* the world; instead they were constructions in the perceiver's mind which directly reflected those in God's mind with varying degrees of clarity. Writers since have proposed less extreme schemes whereby the body translates physical facts about the world into the appropriate language of the mind. The best known of these have attempted to create "artificial intelligence" in machines, and it has been the failures of this approach which have alerted some to the presuppositions which could make such attempts guaranteed to fail.

The following sections will explore the presumed discreteness of the world in a little more detail, and will present various attempts to understand cognition that have implicitly made use of discreteness. In order of their conceptual priority, I will first look at the discreteness of matter and symbols that seems to be consequent upon the presumed separation of mind from world. One significant attempt to deny this separation, in the discipline of ecological psychology, will be presented in some detail, as this material will be referred to in many places subsequently. The second part of what follows will look at the discreteness of elements of the world, and the problems that assumptions about the nature of knowledge based upon this discreteness has caused for attempts to model thinking. I focus on the failure of artificial intelligence projects to emulate ordinary human knowledge about the world, and present this as a conceptual failure due primarily to an unacknowledged commitment to discreteness.

The relationship between matter and symbols.

The World-Body separation theses are: (i) Representations of the world are separated from the physical body and its actions; and (ii) symbolic manipulation of knowledge is separated from embodied agency. The vexed question of the ontological status of the "mind" is behind these theses. A relatively unmodified form of empiricism is still dominant in cognitive science, and it has the characteristic features of an external world of sensory flux which lacks meaningful structure, contrasted with an internal world of structured representations. A chain of causal relations[139] links external matter and internal symbols, but these relations, though perfectly understandable considered as

[139] Regarding causation, the normal material-efficient scientific view of causation is quite compatible with everything I subsequently say about in-discreteness. However I will also explicitly refer to final and formal causes in some contexts.

isolated interactions, become mysterious when the chain is considered as a whole because they ultimately bridge the substance barrier between physical and nonphysical. A materialist appeal to the same sort of stuff being the constituent of both ends of the causal chain only deflects concern onto the kinds of things that escape a materialist explanation, including consciousness and intentionality. Further, the causal chain from outside to inside is doubly mysterious because it somehow achieves a transition from continuous biological processes to discrete knowledge states. These mysteries have consequential mysteries – one consequence is that the agent apparently becomes a passive recipient of raw physical data from which the world is constructed by their mysteriously active mind. Whereabouts along the causal chain does this transformation occur? Another consequence is that it is difficult to conceive of "the agent" separately from the better-understood psychological modules of which they are composed, hence the supreme act of construction appears to be that of a unified self. On a less discrete understanding of the nature of connection these become false problems. One way of conceptualising the status of the discreteness apparent here is to think of a barrier or boundary that encloses and insulates – the idea here is that the brain is necessarily separated from its surroundings.

Hence the problematic insight that drives the World-Body separation thesis is *The brain is a closed system*. Counter-insight: *The brain is an open system*. Physical separation between the brain and the world leads to the insight that the brain *in many important ways* is self-contained. This is not literally true, as energy and nutrients must enter the brain and heat and waste products must leave it, but it is clearly the motivation behind compelling images of brains in vats and the dystopia of the *Matrix* films. Hubert Dreyfus quotes Ulric Neisser's seminal text "Cognitive Psychology" (1967) which grounds a form of modern idealism – in it Neisser asserts that "we have no immediate access to the world nor to any of its properties."[140] The necessity to link incommensurate substances into a single causal chain involving light waves, neural connections, and the phenomenological act of "seeing" results in Neisser's idealistic conclusion that transformation of input is an act of construction. Since the brain is thought to be the exclusive centre for cognitive activity, special mechanisms of communication are

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[140] Dreyfus (1979), *What computers **still** can't do: A critique of artificial reason.* (Cambridge, MA: MIT Press). pp.180-1

needed to link the inner and outer worlds. Modern idealism is represented by two strands which emphasise different elements of this relationship. *Psychophysics* focuses on energy and information transformation, while *computationalism* emphasises information manipulation using the digital computer as a model.

Modern idealism and discreteness

Psychophysics and psychophysiology

Psychophysiologists see themselves as systematically investigating mind-body relations[141]. Their discipline is a refinement of psychophysics, which is itself a development of empiricist theories of perception. The psychophysical view of perception, which focuses on the transformation and transmission of nerve impulses, is represented here by Kenneth Norwich[142]. He introduces a theory of perception based on "conservation laws", or physical laws which operate within closed systems – the brain and nervous system are such a closed system. The conservation law approach captures the insight that "the information content of a stimulus is relayed, with negligible loss, to the sensory receptor and thence to the brain."[143] Norwich's theory of perception consists of comparing incoming stimulus intensities in particular categories in order to assess their relative position on a probability distribution peculiar to each category (a distribution which is crucially unique to the history of each perceiving mind). This is a sophisticated extension of the old empiricist idea of association, except here the inductive inferences are by comparison with a range of relevant things. Perception is therefore an activity which consists of choosing among alternatives: "It implies that the *percept* (which we shall take to mean *that which is perceived*) must always be found among a set of alternatives contained within the memory of the perceiving system."[144] The choice *process* need not be conscious, but the agent is conscious of the conclusion; eg "Ah, you're wearing your green jacket." Therefore unlike computational theories such as David Marr's theory of vision which I discuss below, which seek something

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[141] See Porges (1995) "Orienting in a defensive world: Mammalian modifications of our evolutionary heritage: A polyvagal theory." *Psychophysiology, 32*, 301-317.
[142] Norwich (1993) *Information, sensation, and perception.* (San Diego: Academic Press).
[143] Norwich (1993), p.9.
[144] Norwich (1993), p.12 (emphasis in the original).

close to a realistic perception of the world as it is, and which he explicitly differentiates himself from, Norwich endorses Berkeley's perceiver relativism and updates it into a psychophysical solipsism. Information reduces uncertainty, which also reduces entropy – the uncertainty "reflects not what the world *is*, but what the sensory receptors *think* the world is. [It] implies that we only perceive those aspects of the external world that do not conform to our expectation and, hence, of which we are uncertain."[145]

The psychophysical view investigates the causal chain only up to a point, beyond which detailed analysis of processes expressed as algorithms is necessary. The computational view takes over at the point where transformed sensory input meets memory or other central cognitive functions, for which description in psychophysical terms would be at too gross a level of detail. Two variations on the computational perspective will be discussed next; the first focuses exclusively on the transformed input, while the second attempts to integrate the entire process into an overarching computational theory. The former exemplifies much of contemporary cognitive science, while the more comprehensive approach is represented on the following page by David Marr's influential theory of vision.

Cognitive science

Curiously, the dominant cognitive science perspective endorses the same solipsistic view of perception as Norwich's psychophysicalism. Editors Rodolfo Llinás and Patricia Churchland discern a theme they call "endogenesis" in the chapters in their book "*The mind-brain continuum*" *(*1996). They explain the theme this way: "The crux here is that sensory experience is not created by incoming signals from the world, but by intrinsic, continuing processes of the brain. The essential functions of incoming signals on this view are to trellis, shape, and otherwise sculpt the intrinsic activity to yield a survival-facilitating, me-in-the-world representational scheme."[146] Llinás and Paré, in their lead paper "The brain as a closed system modulated by the senses", reveal that one reason for ascribing "closed" status to the brain is that the alternative, open systems account, exemplified by William James, commits its supporters to an unacceptable *tabula rasa*

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[145] Norwich (1993), p.19.
[146] Churchland & Llinás (1996) "Introduction", In Llinás, R. & Churchland, P.S. (Eds) *The mind-brain continuum: Sensory processes*. (pp. ix-xi). (Cambridge, MA: MIT Press, Bradford Books). p.x.

view of the infant[147]. The way this choice between ontological commitments is presented as a forced two-value selection is strongly indicative of discrete thinking, and it leaves no middle ground available for consideration. On this model of thought an argument against one choice can be made to seem like an argument *for* the other. Presupposing a closed system seems a big price to pay for the apparent benefits of nativism in one's perceptual theory. It seems that endorsing a mind-brain continuum and thereby dissolving the respective discreteness of those particular entities does not extend to creating a mind-world continuum.

The closed-system approach has some attractions, and the most significant is that the internalised model can be created out of arbitrary symbols so long as they are consistently associated with the right kinds of transformed sensory input. The symbols can then be combined into structured formats called computations, while whatever "meaning" they embody can be regarded as fully internal to the cogniser. The ultimate expression of this approach is found in the attempt to computationally model thought, known as the creation of artificial intelligence. The shortcomings of this approach will be discussed shortly in the section which focuses on the second problematic separation, that between objects in the world. It will turn out that a purely empiricist approach has no resources to understand how those objects come to have significance for natural human thinkers. But before that we will look briefly at the last of the exemplars of modern idealism embodied in cognitive science, the theory of vision developed by David Marr.

Computational vision

A full-blown computational theory such as David Marr's, detailed in *Vision* (1982), links sensory transducers on the surface of the body with central processing. His summary statement about vision is perfectly compatible with Norwich's, and Llinás and Churchland's, closed-system approaches: Vision is "the process of discovering from images what is present in the world"[148] Marr's innovation was to rethink the causal chain from outside to inside by breaking it into mutually dependent, yet conceptually

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[147] Llinás & Paré (1996) "The brain as a closed system modulated by the senses." In Llinás & Churchland, (Eds) (pp. 1-18).
[148] Marr (1982), *Vision: A computational investigation into the human representation and processing of visual information,* (San Francisco: W.H.Freeman). p.3.

independent, levels of analysis. The levels are conceptually arranged into a hierarchy reflecting "distance" from the physical relationship between the world and the agent. One attraction of Marr's theory is that it integrated three apparently disparate approaches to explaining perception – starting from the top, or the layer furthest from the world, with an appropriate overarching theory of computation, proceeding to consideration of actual algorithms and representations, and bottoming out with consideration of the hardware implementation. On this view, psychophysics occupies a broad middle level, but extends its remit somewhat into the upper and lower layers. Discovering the world "from" images immediately conveys the strong flavour of Idealism of the Berkeleyan sort inherent in much of cognitive science. Marr's idea of a "$2_{1/2}$-D sketch", intermediate between objective representation of world features and fully subject-centred representation, marks "the last step before a surface's interpretation and the end, perhaps, of pure perception."[149] It is the hopeful locus of a significant transition where the outside becomes unambiguously inside, so it is in many respects an attempt to create something akin to Dennett's "Cartesian theatre"[150], where the subject, regarded as a spectator, experiences an internal model of the world. Lower-level processes, in Marr's terminology, "deliver" information which makes facts about the world "explicit", enabling shapes to be "interpreted".

Alternatives to the approaches to cognition outlined here proceed by emphasising the continuity which is lacking, as part of reinstating connection at the heart of the relation between agent and world. Historically the most productive philosophical move has come from phenomenology, which informed Hubert Dreyfus' critique of artificial intelligence outlined in response to the second problematic separation, to be discussed in the next section. Phenomenology has the tools to perform a similar critique of Body-World separation. However, there is something in phenomenology that restricts its usefulness for such a critique, namely, its focus on the nature of subjectivity. It is a much-expanded and, critically, de-intellectualised subjectivity to be sure; but it enables only a partial dissolution of discreteness nonetheless. The partial dissolution results from a looking-outward *from* the subject and an assimilation *to* the subject of many worldly features; hence, in terms of the agent-object continuum I outlined early in Chapter One,

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[149] Marr (1982), p.268.

[150] From *Consciousness Explained* (1991). Marr's "$2^1/_2$-D sketch" is now termed "mid-level vision" by researchers. Dennett's "Cartesian theatre" was meant to spoof the Cartesian intuition.

phenomenology investigates the unreflective, ready-to-hand experience of objects as part of a unified agent-world field. More primary than this, I suggested there, is the ecological mode, and it is to ecological psychology I wish to turn now to investigate some features that militate against a discrete metaphysic; these features are *agent-environment mutuality* and one of its significant implications, *direct perception*.

An alternative to modern idealism: Agent-environment mutuality

James J. Gibson's starting point in the development of ecological psychology was his distrust of traditional theories of perception - each component of the process had its own discipline (optics, anatomy, psychophysics, neurology), but the overall process was acknowledged by all to be a mystery. The question being answered by all this empirical investigation was *how perception works*, not *what perception does*. Two major things seemed to be wrong: Perception was assumed to be *passive*, caused only when sensory information met sensory receptors; and varieties of anti-realism in psychological thought insisted that the environment could not contain enough information to guide action, what Chomsky termed in the context of behaviourist theories of language "the poverty of the stimulus". In the early 1960s Gibson investigated the sense of touch[151], and he brought to psychology's attention the important difference between passive touch (or being touched), and active touching. Active touching is an act of exploration, and it can provide many different kinds of qualitative information about an object, and most importantly, this information *is* about the object, not about the local transformations of sensory receptors being affected by the object, which then require interpretation. Calling this exploration, too, suggests that the toucher is searching for information. Related to this conclusion about active sensing, Gibson realised that ideas of what constitutes a sense organ were wrong - certainly not just the particular set of receptors being stimulated, since that was too limiting. The entire hand is the appropriate unit for considering active touch. This led to the idea of *perceptual systems*, which not only accept information, but also search for it and ensure stability of its supply. The difference is that receptors are said to be 'stimulated', whereas systems are *activated*. For vision, this means that not only a pair of eyes and visual parts of the nervous system, but also the eye muscles, head and neck muscles, and the entire body, are part of the visual system[152].

The final break with traditional theories of perception came with Gibson's realisation that information is not conveyed by the stimulus which actually impinges on the sensory organ, but by the object which is the source of the stimulus. Much has been made by traditional theories (and by philosophers such as Hume and Kant) of the

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[151] Gibson (1962), "Observations on active touch." *Psychological Review, 69(6),* 477-91.
[152] See Gibson's (1966) *The senses considered as perceptual systems*. (London: George Allen & Unwin).

apparently meaningless flux of changing sensory information at a receptor, and how difficult perception must be as a result. Gibson suggested that perceptual systems are designed to extract *invariant* information from the flux; or more accurately, to distinguish between invariant information from the environment and variant information caused by the perceiver's own movements. The most explicit working-out of his theory was in relation to vision[153], so references to perceptual systems in this context from now on will be to vision. The major components of ecological perception are: the environment to be perceived; the information available for perception, and the activity of perception.

In relation to *the environment to be perceived*, the overarching concept is the *mutuality* of animal and environment; they are also described as being *coupled*. Animals are surrounded by the environment, they are part of it, and they have been shaped and selected by it. In turn they act upon it and move through it. The environment consists of surfaces and the medium between them, and the properties of surfaces convey a tremendous amount of information – information about shape and form, thanks to the light from edges, corners and planes; and information about the qualities of the surfaces, thanks to curvature, texture, density gradients, and differences between adjacent types of surfaces. These can be illustrated as follows: where two surfaces meet is always highly significant, whether as a cliff (solid meets gas, and this affords stepping or falling off), as a step (solid meets solid, this affords walking or climbing), or as a beach (solid meets liquid, this affords wading or drowning). Of course not all these aspects of surfaces are relevant to creatures of all kinds. Air and water are mediums through which animals can move and information be transmitted. In fact, thinking of the medium surrounding us as *space* suggests that it is empty, but it is full of ambient information - light, sounds and odours. The environment is *structured*, but not in an objective way (ie, according to the laws of physics). The structure occurs because surfaces are arranged into relevant objects which can always be regarded as themselves part of a larger object - that corner is part of (ie, is nested within) a chair, which is nested within a workstation, within a room, a building, a campus etc. The corner does not exist in isolation. Of all the myriad ways surfaces and mediums can be arranged, only a small subset will be relevant to any given species.

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[153] Gibson (1979) *An ecological approach to visual perception.* (Boston, MA: Houghton Mifflin).

In relation to *the information available for perception*, there is confusion, says Gibson, about what light is – whether it is physical energy, or a stimulus for vision, or information. The way physicists describe light as radiation does not convey the way it bounces off objects and fills the air as ambient light. Natural light is structured because its intensity varies due to the pattern, texture or configuration of surfaces it bounces off. Structured light therefore forms an *ambient optic array.* The original, physiological concept of a stimulus, which Gibson adheres to, is that it is the efficient cause of sensation, not the cause of a response, as psychology defined it. In this sense a stimulus carries no information about its source - only stimulation in the form of a structured array that changes over time does this. This is another instance of the importance of context – a stimulus is a de-contextualised sensory impression, whereas *stimulus information* is an ecological concept. We are used to the idea of information as a medium of exchange, but that is not the kind of information we get from the environment. The components of the visual array are all the visual angles from the features of the environment, in the same sense as early writers such as Euclid (c.300BC) talked of a "visual cone" with its apex at the eye and its base at the object. Gibson adopts Euclid's idea as a way of introducing the fullness of the visual environment, since nearby objects are always displayed against a background of other objects, and ultimately against something huge like the sky, the sea, or a cliff. The visual cone is then filled with surfaces at various depths, or in Gibson's term, the near ones are *nested* within the farther ones. Hence the visual array has no gaps, and instead of an environment consisting of free-standing objects Gibson suggests an environment of illuminated surfaces. This environment changes in regular ways as the observer moves. Think of the simple trick you can use to judge how far apart two objects are - you simply move your head from side to side. When you move your head like this, something changes (your head), and something stays the same (the location of the two objects). When you move towards the table what appears to be a trapezoid changes its shape, and rarely do you see a rectangle. But the relations between the four sides and the corners stays the same. Observers are said to be *scanning* the optic array at times like this. If we hadn't moved, we may have assumed that the table really *was* a trapezoid (and there are tables like this around the campus). When an observer moves their whole body forwards, the optic array *flows* around them. Normally this is enough to inform us about the

invariant structure of unmoving objects, but when both the observer & the object are moving, or seem to be moving, confusion can result (eg, the moving trains illusion).

A concept central to the information available for perception is the aspect of ecological psychology that has received most attention from other disciplines – the concept of *affordance*, a word Gibson claims to have invented. Ecological psychology uses affordances as a way of thinking about information in a very specific way which doesn't imply conceptual skills, intelligence or any kind of processing - they are what the environment can do for a creature, or what it "affords" the creature to do to it. The overtly pragmatic implications of affordances are no accident. John Dewey, half a century earlier, nicely captures the challenge the pragmatic perspective implies for traditional views of perception, though his comment is not directed at affordances as such, when he says:

> It would be difficult to find a fact more significant of the traits of nature, more instructive for a naturalistic metaphysics of existence, than this cleavage of the things of human experience into actual but hard objects, and enjoyed but imagined objects. One might think that philosophers in their search for some datum that possesses properties that put it beyond doubt, might have directed their attention to this direct phase of experience, in which objects are not a matter of sensations, ideas, beliefs or knowledge, but are something had and enjoyed.[154]

Gibson's description of affordance is "the affordance of anything is a specific combination of the properties of its substance and its surfaces taken with reference to an animal."[155] The properties in question are physical properties that are described in non-physical, or ecological, terms. They are *of* the substance, so are objective in the sense of being available to others, but they have to be others with the right kinds of abilities who happen to be behaving in the right kinds of ways and in the right kinds of conditions. Therefore a description of affordances in terms of classical objective physics (rigidity, density, mass etc) is not relevant, since that form of objectivity is one divorced from any possible perceptual system – as Thomas Nagel puts it, that kind of objectivity depends

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[154] Dewey (1929), *Experience and nature (2nd edition)* (La Salle, IL: Open Court). pp. 71-2.
[155] Gibson (1977), "The theory of affordances." In Robert Shaw & John Bransford (Eds.) *Perceiving,*

on a "view from nowhere"[156]. It follows that a flea and an elephant will have completely different interactions with air, ground and water. For a flea, water might afford walking, while for an elephant it must (at best) afford swimming. Consider a piece of fruit which is part of the diet of a creature: the fruit contains nutrients that the animal needs, but detecting nutrients directly is not what attracts the animal, it is a combination of colour and size indicating ripeness which does that. Affordances are the aspects of a habitat that can serve to regulate the animal's behaviour, and it is not just the nutrients but the ease of reaching, chewing and digesting that matter. The fruit has a set of properties, but the significance of these properties lies in relation to the animal and its behaviour. Hardness or softness is relative to the animal's beak or claws, as is size.

The stress on the mutuality between animal and environment does not mean that an affordance ceases to exist when an animal is not present, as some have interpreted it in a Berkleyan, perceiver-dependent reading. The kind of objectivity I spelled out above should guard against this interpretation. The *existence* of an affordance is not dependent on a perceiver, only its utilisation. The mutuality in question is not a holistic, mutually constitutive relation between a particular animal and environment which exists only while the affordance is being utilised, as a phenomenologist might explain the mutuality between my current mood and my increased sensitivity to the feel of my body which results in my feeling "heavy" today; rather, it is a global relation between the capacities and needs of a population of creatures and the features of the environment that have selected and shaped it. Affordances are aspects of the environment of all creatures, but particular instances of an affordance may be realised by an animal, as when a seagull drops shellfish on a rock to split them. The affordance in this case exists in any sufficiently large, hard and flat surface available to the gull, so it exists independently of the gull. The concept of affordances suggests that flexibility of behaviour rather than stereotypical acts is the norm, since affordances do not prescribe either the kinds of objects to be valued, or the kinds of acts which utilise them. The crucial thing is the value this represents to the population in question. For ecological psychology, identifying value is the true driver of the selection process in evolution. More complex creatures can identify more sources of value; ie more contexts to satisfy

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acting, knowing: Toward an ecological psychology (pp.67-82) (Hillsdale, NJ: Lawrence Erlbaum). p.67.
[156] See Nagel (1986), *The view from nowhere*. (NY: Oxford).

dispositions (conventionally glossed as "instincts"), more ability to use secondhand information ("learning"), and more new contexts that are analogous to previous contexts ("innovation"). This contrasts with a typical reductionist view of selection which claims that energy efficiency is the underlying driver – an example of this kind of analysis is the following: "Feeding is simply the means of acquiring the materials necessary for building, maintaining, and powering the vehicle that carries the next generation."[157]

The final component of ecological psychology is *the activity of perception.* When you look at a tree what you have is *direct* perception; it is the activity of getting information from the ambient array of light (or other stimulus), or the activity of "information pickup" as Gibson calls it. Mediated perception is what you get when you look at a picture of the tree. Direct perception for Gibsonians is not mediated by retinal pictures, neural pictures, or mental pictures. I will briefly look at one area of research, which concerns the direct perception of surface layout. The standard theory of depth perception asserts that the third dimension of space must be added back into the flat picture received by the retina. Various cues are said to assist this, including linear perspective, light and shade, and binocular disparity, and mechanisms to provide these processes form part of computational theories of vision such as David Marr's. The question of whether the use of such cues is learned or innate has raged for centuries. The ecological alternative asserts that there is no special kind of depth perception, as the third dimension is never in the environment to start with - it is either an invariant property of objects dependent on the viewpoint of the observer (ie, when you move around a desk the side becomes a back, and width becomes depth), or a property of the variant information dependent on the observer's own distance from the object.

The famous “visual cliff” experiment was designed by Eleanor Gibson and colleagues, and is widely (mis)interpreted as providing support for innate depth perception ability. A textured surface on two levels, "shallow" and “deep”, is visible under a sheet of glass; human babies and other animals were placed on a narrow platform between the surfaces, and all animals showed a preference for the shallow side rather than the deep side. The ecological interpretation is that the affordance of its *edge* is being perceived, not the third dimension. Cliffs are highly significant ecological

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[157] Quoted in Reed (1996), *Encountering the world: Toward an ecological psychology*. (Oxford: OUP) p.31.

features; they are falling-off places. The edge in question is an occluding edge, where one surface appears to overlap another, but unlike other edges like the meeting of walls, this edge is special in that it is the edge of a surface of support. It is a negative affordance for locomotion, if too big, or an affordance for stepping, if small in relation to the creature's leg length. What animals need to perceive is not layout as such (the angles and slopes of the surfaces) but the affordance of the layout.

The activity critical for perception is *self-movement*. Affordances are possibilities for action, either doing or avoiding things. Only in a situation of blind panic or near death would an awake animal not be scanning for affordances. Movement and perception are mutually necessary, since visual perception guides movement, and movement is necessary for perception. Recall that perception of invariant information depends on its differentiation from variant information caused by movement, and this differentiation results in the ease of judging distance by making small head movements, for example. A second type of evidence for the movement-perception relationship is the rapid habituation of perceptual systems that are artificially kept still, as when all tiny, rapid eye movements are suppressed, causing "blindness". I will look at just one of the ways optical information guides locomotion, before wrapping up this overview of ecological psychology.

I mentioned early in the first chapter when introducing the ecological mode of object perception that optic flow specifies movement, so absence of flow indicates stasis. More specifically, *flow perspective* describes the way the environment flow varies depending on the direction of movement and the direction of looking. When the creature is moving forward, outflow from a point indicates approach towards that point, and a shift in the centre of the outflow indicates a change of direction. What is seen is not the *lines* of the outflow, but the *solid angles* created by the moving observer. If you try to judge the distance between two objects by looking sideways at them as you walk past, a quick glance is often not sufficient to judge direction (ie, creates too small an angle), whereas looking takes longer but is more reliable.

The lessons of ecological psychology are various, and pointedly related to the shortcomings of discrete thinking. They can be summarised under three main points: first, that the world is continuous and that perceptual systems accurately acquaint us with the world; second, that value is a relation between agent capacity and world opportunity, neither of which can profitably be expressed in discrete terms; and third,

appearances and what lie beneath them are not radically disjunct – agents know about substances thanks to the generally reliable information available from their surfaces. One aspect of discreteness that falls outside the scope of ecological psychology is the nature of individual creatures and their relationships; that is, it does not devote much attention to the notion of ecology itself. I briefly considered this while discussing Spinoza's substance monism and its relational view of existence, which has been taken as support for an ecological philosophy, but I will return to this in Chapter Five when considering process philosophy. The idea I want to pursue there is the dependence of what comes to be upon what already is, and the way the contingency of this relation militates against a boundary-driven view of individual identity.

Now that I have presented a view of cognitive science focussed on the discrete separation between the world and the mind it presupposes, I turn to the second form of separability licensed by discrete thinking, that which insists on the standalone nature of things in the world. While the first form of separation results in an intuition that the perceiver's interests are entirely separable from the world, the second form takes this exaggerated objectivity for granted, and results in an intuition that the world is constituted in such a way that it conforms readymade to our interests. What connects these apparently contradictory intuitions is the constructive power of reason in its drive for intelligibility – the first intuition is that such construction is necessary, due to separation between mind and world, while the second is that such construction works thanks to the world being in a state amenable to the constructive activity.

The discreteness of the world.

The World-World separation thesis is that states of affairs in the world fall into discrete parcels of reality that can in principle be aligned precisely with discrete elements of knowledge. In other words, facts are atomic, and can be discovered in the world, or even stronger, be *read off* the world. The self-evident existence of objects in the ecological mode and their nature as ready-to-hand understandably inclines us to think that the world is in many important respects compatible with our interests. "Carving nature at the joints" into natural kinds is a more sophisticated rendering of this self-evidence. While there is nothing wrong with subscribing to this thesis as a heuristic device, problems arise when it is regarded as a metaphysical thesis, either explicitly or worse, implicitly.

Two problematic insights underpin this thesis: (1) The nature of a fact is self-evident, and (2) the nature of a world is self-evident.

One of the best examples of explicitly discrete thinking about the world is Ludwig Wittgenstein's *Tractatus*[158], which brought the programme of logical atomism to its fullest expression. Historically this work marked a move away from the then-dominant idealism towards a scientifically oriented positivism, and it influenced the subsequent work of the so-called "Vienna Circle", which included philosophers Otto Neurath, Rudolf Carnap and Herbert Feigl, and the mathematician Kurt Gödel. These thinkers strived for clarity and precision in thought above all else.[159] The *Tractatus* brought the phenomenal clarity of thought together with the perceptual distinctness of objects in the world in the form of a 'fact' that was more than just a thing. Wittgenstein says the following right at the outset: (i) Facts make up the world ("The world is the totality of facts, not of things", "The world divides into facts"); (ii) facts are independent of each other ("Any one can either be the case or not be the case, and everything else remain the same"); and (iii) facts are composed of objects ("An atomic fact is a combination of objects (entities, things)", "It is essential to a thing that it can be a constituent part of an atomic fact."[160])

It is a subtlety of this view that facts are collections of things, and although the things may be discrete it is at the level of the fact that the discreteness in question actually operates. The crowd of schoolboys on the playing field below me, considered as a crowd with a particular arrangement or structure, is a fact. Their position a moment later is also a fact, should I choose to make use of that arrangement for some other purpose. This new fact is logically independent of the first fact, and there can be no doubt about whether any given boy is included within the arrangement that makes up a fact – they cannot be vaguely within or without or on the boundary of the fact. Although logical atomism is no longer influential in philosophy the empiricist supposition about the disconnected nature of sense-experience and its relationship to clarity of thought is still dominant; further, many philosophers prefer to reserve judgement about questions of ontology in favour of the deliverances of "our best science", and it is expected that what this science delivers will be discrete units of knowledge in the form of facts.

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[158] Wittgenstein (1922), *Tractatus logico-philosophicus.* (Trans. C.K.Ogden). (London: Routledge).
[159] Logical positivism." *The Columbia Encyclopedia*, (online).
[160] TLP – 1.1, 1.2, 1.21, 2.01, 2.011. These are five of the first ten statements.

Discussion of the previous separability problem focused on cognitive science as exemplifying many facets of discrete thinking. This section will look in some detail at what could be regarded as the precursor to cognitive science, the attempt to model thinking by computational manipulation of symbols known as Artificial Intelligence (AI). In particular I will discuss the critique by the philosopher Hubert Dreyfus of the most ambitious form of AI, known as Strong AI. It is interesting that one of the founders of AI was Herbert Simon, who had been a student of the Vienna Circle philosopher Rudolf Carnap.

Artificial Intelligence

The problematic insights on which the presumed discreteness of the world rests have come into sharp relief through the ongoing failure of AI. The self-evident nature of facts and the world was supposed to guarantee the ability of software to mimic or improve on human intellectual performance; admittedly by beginning humbly, with simple applications, but swiftly scaling up to extra-human feats. One unacknowledged reason for the persistence of this ambition was the belief that since discrete facts are atomic facts, and atomic things can be built up into larger things, then normal or even superhuman intelligence can be achieved through the operation of *linear* scaling-up routines – just more of the same kind of thing. The most damning analysis of the shortcomings of strong AI has come from Hubert Dreyfus[161], who has highlighted the uncomfortable reasons why "more of the same" is an inadequate strategy for understanding cognition. However his critique appears to have left the Strong AI community largely unmoved as they anticipate the development of ever more powerful computers, judging by a recent enthusiastic prediction of future prospects by a senior figure in the field, Ray Kurzweil. He embraces the methodology of linear scaling up, and invokes a parallel between computing power and a nuclear reactor, where making the mass of fissionable material larger eventually exceeds a critical mass, which triggers a nuclear reaction. Beyond the computing "critical mass", suggests Kurzweil, lies superhuman machine intelligence[162].

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[161] Dreyfus (1992).
[162] Kurzweil (2006), "Why we can be confident of Turing Test capability within a quarter century".

Dreyfus' critique is located within the phenomenological tradition, particularly that influenced by Martin Heidegger and Maurice Merleau-Ponty. The work of these thinkers emphasises the complement to discreteness, in-discreteness, when it comes to matters of connection. There is a continuity to the flow of events within which agency is situated, and a form of continuity expressed as a dynamic unity between the agent and their world. Dreyfus' critiques do not explicitly invoke in-discreteness of course, but his diagnosis will shed more light both on the limitations of the discrete worldview and on the in-discrete character of his description of how the world really works.

Dreyfus' concerns about discrete facts are addressed to what he identifies as "The Ontological Assumption" held by workers in computer intelligence, which is that all relevant information about the world must in principle be analysable as a set of situation-free determinate entities[163]. Unpacking this diagnosis results in the following description of the ideal world from an AI perspective – the world presents to an agent as information which is readily identifiable as either relevant or irrelevant; its relevance is to be judged against a set of criteria that make no reference to the agent's wider concerns, either practical or existential; those criteria refer principally to characteristics of objects and places, with events and activities being secondary attributes; finally, objects and places are tightly-circumscribed things with in-principle determinable boundaries. A moment's reflection reveals just how unrealistic The Ontological Assumption is, as Dreyfus points out that many aspects of everyday life do not cohere around substantial entities at all:

> A mistake, a collision, an embarrassing situation do not seem on the face of it to be objects or facts about objects. Even a chair is not understandable in terms of any set of facts or 'elements of knowledge'. To recognise an object as a chair, for example, means to understand its relation to other objects and to human beings. This involves a whole context of human activity of which the shape of our body, the institution of furniture, the inevitability of fatigue, constitute only a small part. And these factors in turn are no more isolable than the chair.[164]

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[163] Dreyfus (1992), p.156.
[164] Dreyfus (1992), p.210.

Dreyfus suggests that the only reasonable solution is to deny the separation of fact and situation, and to recognise the unboundedness of both. This relaxing of discreteness is compatible with a pair of concepts Dreyfus borrows from Husserlian phenomenology and Gestalt psychology that locate the perceiver and their environment in a mutuality: these are the notions of outer and inner horizon.

The first in order of temporal priority is a phenomenon familiar from looking at figure-ground illusions such as the face-vase drawing. This is the *outer horizon*, which means that you can only see the figure, say the vase, by *actively ignoring* the ground, the faces. This information is ignored but not excluded. To see the vase you must be seeing the whole set of possibilities for seeing, but some are determinate (resulting in you seeing the vase) and some are indeterminate (resulting in the possibility of seeing the faces). An AI program looking for certain features in a mass of data cannot distinguish the significant foreground from the less significant background of possibilities without unwieldy calculations, if at all. The second perceptual horizon allows us to zoom in on the significant features of the figure against its background – it may have far more features than we are currently interested in. This *inner horizon* allows us to know something as a whole before we know all its details – it results from our history of past experience with the object or situation, which guides us in filling in new details. Software, in contrast, must attempt to identify the whole on the basis of its recognisable parts, a slow and often error-prone process[165].

Taken together, the outer and inner horizons allow us to learn and apply our knowledge seamlessly in situations that may have no clear definition, no clear boundary, and no absolute rules. When you are in a restaurant with unfamiliar dishes on the menu, the outer horizon will consist of your sense of how to behave in public, what to expect from restaurants and so on. Your inner horizon will guide you to expect certain kinds of food as first course, second course etc. Any new foods will be fitted into these expectations, or perhaps challenge them, but will not threaten your definition of restaurants in particular or public places in general. The critical thing here is that merely giving a computer system exposure to the relevant situation is not going to be enough, since it needs to know not only what *is* relevant but also what *isn't*. A wide range of

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[165] Dreyfus (1992), pp239-42.

experiences must be sampled and importantly, lived through, in order for the living-through to become experiences and for differences between experiences to be differentially reinforced and therefore to become salient.

The impossibility of specifying necessary and sufficient conditions for the distinction between inner and outer horizon suggests that they themselves will, in practice, be somewhat indeterminate. It also suggests that any given subset of "knowledge", however defined, could in principle be at one time an element of my inner horizon, and at another time an element of my outer horizon, or at the very same time both an element of my inner and your outer horizons. This possibility results from the pre-existing connections between states of affairs in the world and the concepts that we use to manage those affairs, and the nature of these connections is holistic. This kind of holistic knowledge is extraordinarily difficult for computers to simulate. On a small scale it allows chess champions to glance at a board and see the significant strategic features of the game, a skill which even Deep Blue, the supercomputer which beat Anatoly Karpov in 1999, could not do. A horizon is a structure centred on a perceiver, but without a determinate surface; so as you approach one, it recedes before you, while its nature allows some ambiguity about its exact "position". Hence the alternative to discreteness suggested by the phenomenological analysis of AI's failures is not the polar opposite to discreteness, namely continuity, but something intermediate between discreteness and continuity that makes the identity of a discrete thing less determinate, and which acts to diminish the discreteness.

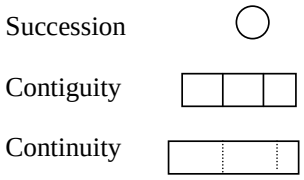
3.3 Continuity

Simple continuity

Classically, three ideas relevant to continuity were identified by Aristotle as part of his analysis of change[166] – he distinguished "succession" (things of the same kind follow one another, hence gaps or insertions of things of different kinds are possible), from "contiguity" (successive things touch, hence a bound or discontinuity is possible) and

[166] *Physics*, Bk V, Ch 3.

"continuity" (successive touching things share the same limits, hence forming a gapless, jumpless unity). The three ideas are easily conveyed by diagrams, as follows:



The core idea for Aristotle is that in continuity there is an absence of a mediating boundary. The modern mathematical notion of continuity takes its cue from Euclid, some years after Aristotle, whose first axiom defines a point as an extensionless region of space, out of which the continuity of a line can be built, and from which in turn all planes and solids can be constructed. Together these ideas of continuity reinforce each other – both begin with the assumption that "things" are necessarily separate, and we are left with a continuity which is extremely abstract and seemingly unachievable in any natural way.

The most stringent definition, that of continuity itself, is easily found in the everyday world by searching out unities – where there is one-ness, then something characteristic of that one will almost by definition be a continuous feature of it; its colour, perhaps, or its outline (or its being). Two simple senses of continuity are unhelpful for connection: First, where a *unity* transcends or combines individual things, such as two blobs of paint which merge to form one big blob; and second, where *sameness* overwhelms variation, such as the uniform redness of a red ball. If continuity requires unity then it seems to be a very limited idea indeed, and one which has little independent existence, since unity is a prior necessity. In fact the mathematician Bernhard Riemann, in 1854, could think of only two examples of what he called "multiply extended continua", that is, things continuous in themselves: The "space of colours" and the "space we move in"[167]. Further, simple continuity depends upon the notion of sameness, which is a sterile ground from which any further matters of interest are unlikely to arise. Out of sameness only more sameness can arise. Out of difference new structures can emerge which make use of difference – Martin Heidegger is

[167] Cited in Koenderink (2002), "Continua in vision." In Liliana Albertazzi (Ed.) *Unfolding perceptual*

particularly insistent about this: "The equal or identical always move towards the absence of difference, so that everything may be reduced to a common denominator. The same, by contrast, is the belonging together of what differs, through a gathering *by way* of the difference."[168] Heidegger here combines both the idea of difference and a certain dynamism ("a gathering"), which I will return to below in my discussion of a fuller understanding of continuity.

However there is one way to get close to continuity, and this is to experience it. Many people claim, without the need for deep phenomenological analysis, that the world of sensory experience is largely one of continuity – in one sense, the continuity is *felt directly*, in the form of musculo-skeletal feedback and the feeling of ordinary sensory experience; and in another sense it can be inferred easily, since even momentary noticing always discloses a sensation available to be noticed, hence there can be no "pre-noticing" cutting-up of the sensory flow into discrete portions, and there can be no necessary divisions in the manifold of sensation. Neither sense of continuity is undermined by the fact that our visual system creates apparent continuity out of discrete but fast-moving film images – that is, after all, not natural vision but an illusion, or in the terminology of ecological psychology, a "mediated perception." These apparently simple considerations conceal a number of problems which serve to complicate the continuous versus discrete distinction; these are the problems of construction and divisibility.

(i) The problem of construction. If you think of things as being composed of tiny point-like entities, then it is easy to conceive of continuity as just being the ability to insert a new point between any given points. This idea of *density* or compactness, which originated with Leibniz, is applicable to the continuity of the Rational and Real numbers; it is density "all the way down"[169]. But accepting this view of continuity does not necessarily require accepting that nature is "really" fully discrete in its essence, since like Leibniz you may distinguish between the impossibility of further insertions of reality (and thereby identify a "discontinuity"), and the additional possibility that such a

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continua (pp 101-18) (Amsterdam: John Benjamins)..p.101.

[168] Heidegger (1971), "…poetically man dwells…" in Albert Hofstadter (Trans.) *Poetry, Language, Thought.* (NY: Harper). p.214 (emphasis added)

[169] Note that the kind of continuity exhibited by the Rational & Real numbers is different, since there are an infinite number of gaps in the Rational number line caused by irrational numbers, which can't be expressed as fractions of integers.

discontinuity has a positive existence, such as a gap or the space between genuine unities, and is therefore evidence of "discreteness"[170]. Although both senses agree that all apparent continuity is constructed, since this never-ending insertion of reality is not possible in the everyday world, the former sense would allow that *contact* (ie a discontinuity which does not create a gap, hence creating contiguity) could still be a near-continuous and natural feature of the world.

(ii) The problem of divisibility. A unity is the everyday exemplar of continuities of various kinds. Cutting a unity results in smaller exemplars of continuity. Later in the *Physics*, after restating his definitions of the three terms introduced above, Aristotle goes on to point out that "…nothing that is continuous can be composed of indivisibles."[171] That means that, if at some point in the cutting process a "part" is revealed which cannot be cut further, then continuity has ceased and the part is properly "discrete" – it is an atom of some sort. The alternative, of endless divisibility without "bottoming out", is a strong definer of continuity. Together, these two considerations suggest a very tight definition of continuity, one which can only be achieved by abstractions such as the Real numbers, and maybe time. Given these constraints, the closest a naturalism about continuity can apparently come is as contact, a touching at nature's "natural" boundaries. A more optimistic prognosis is that something useful about continuity may be gleaned from a closer look at the Real numbers, and time considered as duration.

The continuity of the real numbers

I have several times made mention of the system of Real numbers as an exemplar of continuity, and they are often invoked as an agreeable alternative to the idea of continuity as a simple unity. Michael Dummett uses the continuity of the real number line to undermine an intuition that the continuity of instants of time can be the same as the notion of simple continuity set out above[172]. Dummett's main target is realism, focussed in this case on the reality of "instants" of time. It is a tenet of realism that the objective nature of reality is in principle capable of precise and singular characterisation

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[170] Crockett (1999), "Continuity in Leibniz's mature metaphysics." *Philosophical Studies, 94,* 119-138.
[171] Book VI, Ch. 1, 231a24-25.
[172] Dummett (2000), "Is time a continuum of instants?" *Philosophy, 75,* 497-515.

– that is, all aspects of reality are *determinate*; if not currently determinable due to shortcomings in knowledge or equipment, then at some time in the future. The intuition about the continuity of time is the discrete intuition that would have time as being built up by concatenating a multitude of atomic instants, and the realism in question is the existence of those instants. By looking more closely at the nature of real numbers Dummett is able to illuminate what it is to be determinate, while at the same time clarifying the nature of continuity.

We think we know that time and the real numbers are in fact continuous – but of what does this 'continuity' consist? There are certainly no gaps in the passage of time or the real numbers, and at any given scale of accuracy another instant or number can always be inserted between any two instants or numbers; that is, time and the real numbers are "dense". The parallel between the two breaks down when the implications of ordering instants and real numbers by magnitude is considered. For instants of time the ordering is "complete", which means that for any ordered subset of instants the last member is wholly within the subset, and there is no overlap with the succeeding subset – in Aristotle's words, quoted earlier "the complete difference marks the end of a series". However the same cannot be said of real numbers, since each real number, however finely discriminated, has a zone of indeterminacy around it, and this zone is *essential and inscrutable*. It can be penetrated by achieving greater and greater accuracy, but only to the extent that the zone of indeterminacy becomes smaller – it can never be eliminated. The last real number in an ordering could not be wholly within the subset.

The indeterminacy can be illustrated by thinking of what it would be to be the last real number before, say, the real number 2. Would it be 1.9, 1.99, or perhaps 1.999999999999999? None is correct, though clearly the last number is more correct than 1.9. The true answer is that no number can be fixed on, and that a characterisation of that 'last' number must be dependent on the level of accuracy one adopts. A realist might insist that, even though a finite series of steps to achieve ever-greater precision will not settle on a precise point, an infinite series could do so. This series would be said to *converge* on a number in the same way that the well-known infinite series $1/2^n$ which depicts Zeno's tortoise-and-Achilles conundrum, formed by progressively halving the remaining distance, sums to (that is, converges on) the determinate number 1.

Dummett's conclusion is that convergence is a vain hope, if the model of continuity provided by the real numbers is to be any guide. A real number, rather than

being a point-like entity on the model of a supposed instant, is actually more like an interval, or range of possibilities. As the infinite series progresses the interval will become smaller, but the series will never converge. Since convergence in the case of progressively refining a temporal interval is also supposed to eventually disclose a determinate instant, instants of time too are ultimately intervals. Therefore the continuity of the real numbers consists of a space of infinite divisibility, which at any given scale consists of densely overlapping zones of indeterminacy. Applying this understanding back to time results in a revised model for instants which, as intervals, makes time duration-like. Duration will be discussed in more detail next. A real 'number', like an 'instant' of time, is neither fully atomic nor fully continuous, so although this kind of dense continuity cannot be found outside the Real numbers and time, the lesson here is that overlapping density regardless of the scale is constitutive of continuity.

The continuity of duration

Duration is a temporal unity, an apparently "blob"-like indivisible continuity. Earlier in this section (and rather briskly) I dismissed this kind of continuity as of limited application to connection, and yet duration has been invoked as an ideal vehicle for opposing discreteness. What is at stake here? The term "duration" entered philosophy as a term of art in the works of Henri Bergson[173], though the concept received its anti-discrete impetus somewhat earlier from Charles S. Peirce[174], and it has been recently championed by Sandra B. Rosenthal[175]. Rosenthal's project is in some respects akin to the present work, though the continuity she seeks to recover is concentrated on temporality, and her perspective is primarily that of pragmatic philosophy. Of contemporary metaphysics, neither Whitehead's process nor Paul Weiss' substance, she argues, adequately reconcile discreteness and continuity in relation to time; conversely, the fundamental intuitions of the pragmatic perspective "lead to its riddance of all remnants of the fully discrete, the fully actual, the fully determinate, the fully fixed."[176] While this is a project which appeals on a number of fronts, I will suggest that

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[173] See, for example, *Matter and Memory* (1959/1896) (New York: Doubleday).
[174] See Peirce (1958a), "Questions concerning certain faculties claimed for man." In *Charles S. Peirce: Selected writings – values in a universe of chance*. (Ed. Philip P. Wiener, pp.15-38) (New York: Dover).
[175] Rosenthal (2000), *Time, continuity, and indeterminacy: A pragmatic engagement with contemporary perspectives*. (New York: SUNY).

Rosenthal's offering up of a pragmatic conception of duration as the epitome of temporal continuity is undermotivated by her understanding of continuity. A fuller understanding of just this issue is the focus of the present work, and a fuller discussion of process philosophy's contribution will be found in later chapters.

Rosenthal charges that contemporary metaphysics, whether process or substance, has failed to escape the discrete thinking of its predecessors, and that in particular no principled account is possible of how discrete components can achieve continuity. She accuses all philosophical traditions, with the exception of Bergson and pragmatism, of attempting to build from the discrete (the cosmic, the underlying, the really real) to the continuous (the experienced), and in so doing they have failed to properly account for temporal continuity. This move relegates temporal continuity to something merely subjective, a construction. Even those philosophies most informed by a respect for experience, such as Whitehead's, she alleges, have a basic intuition of cosmic time as the "*bringing together*" of discretes which clashes with their own avowed understanding of human experience as "pervaded by the fundamental holistic intuition of "*emergence within*", as she characterises the opposing insights[177]. Only pragmatism keeps "emergence within" in its move to cosmic time. James Felt has his own version of these alternative paths to continuity – he contrasts the continuity arrived at conceptually as a continuity of exclusive, quantitative homogeneity, while the continuity directly experienced is a continuity of inclusive, qualitative heterogeneity[178]. For Rosenthal and many other commentators, Bergson's metaphysics, which has indivisible pure time or real duration at its heart, has no room in it for emergence at all, and seems to eschew the pragmatic concern with everyday experience. With respect to the discreteness versus continuity debate Rosenthal is participating in, Bergson therefore represents a third continuity alternative to Whiteheadian process and pragmatism, and I will be looking at his conception of duration in some detail soon.

Rosenthal reconstructs Peirce's "synechism", a doctrine of a continuity which pervades consciousness and the universe, and which she wishes to reinstate at the heart of temporality. The core element in this continuity is an understanding of

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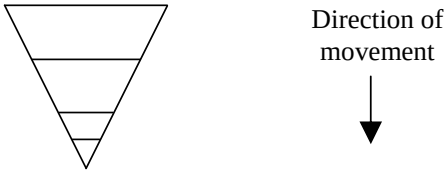
[176] Rosenthal (2000), p.9.
[177] Rosenthal (2000), pp.29-30. Emphases added.
[178] Felt (2002), "Epochal time and the continuity of experience." *The Review of Metaphysics, 56 (1)*, 19-36. (pdf pagination differs; Pp.1-12). p.7.

infinitesimals – not a numerical infinity of very small things, but the infinite divisibility utilised by Spinoza to motivate his idea of modal intensity, and which is so characteristic of the Real numbers. The focus of Rosenthal's interest in Peirce is his analysis of the immediacy of consciousness of the present, and his insistence that we must be directly aware of the past as it recedes – in order for the connection between present and past to be seamless and for memory to work, he says, time cannot be composed of independent instants, and we cannot be aware of the present in a finite interval of time[179]. A series of real infinitesimal steps constituting a continuous flow allows the present and past to blend seamlessly together.

Peirce gives different accounts of how continuity is to be conceived as resulting from infinitesimals. One accompanies his argument that no cognition is unconditioned by a prior cognition, yet there can be no "first" cognition in the series. In infinitesimal-talk this is akin to Zeno's tortoise-versus-Archilles argument, but reversed – in that argument, thinking of the tortoise as always "winning" and the race as never ending means that the race will always have a "later" moment but never a last moment. Peirce asks us to imagine an inverted triangle being gradually dipped in water[180] – a cognition is represented by the water level line which truncates the triangle, thus:



The apex of the triangle represents the cognised object prior to any act of cognition, while the subsequent longer lines represent increasing richness of experience.

Peirce's own use of this example to demonstrate infinitesimals concerns the ability to insert an infinite number of lines above the apex of the triangle. His conclusion (thinking in reverse) is that as one nears the apex the lines become increasingly close together but another line can always be inserted, so the continuity assured by "gradually" dipping the triangle in the water is reflected in the ability to infinitesimally

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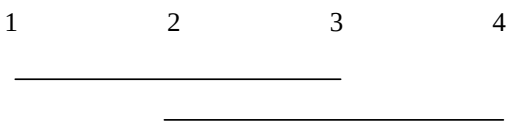
[179] Rosenthal (2000), p.121.
[180] Peirce (1958a), pp.37-8.

add more triangle. There is no "first" cognition because, as he says, "For any such section is at some distance above the apex, *otherwise it will not be a line*."[181] There is a second way to make use of Peirce's example, one that is directly relevant to duration, though neither he nor Rosenthal do so – think of the length of that water level line, which is representing the increasing richness of a cognition, or the experience of duration. This line is also increasing in length as the triangle is dipped (as the cognition develops), and the increments in length are infinitesimal while the growth of the line is continuous. Again, there is no shortest length – either there is a line, infinitesimally short, or no line at all at the apex of the triangle. However, both of these applications of the idea of infinitesimals are problematic because they depend upon a pre-existing unity (the "cognition" line itself, as Peirce's words emphasise above) being continuously extended, but which is not itself explicable in the same way.

Rosenthal presents Peirce's argument specifically directed at the continuity of duration. This turns on his distinction between a point-like instant of time, and a *moment* as an infinitesimal duration, or interval. These intervals, he says, overlap; for example:



Each interval, considered alone, provides *immediate* perception of its beginning, middle and end, which points (numbered in the diagram) Peirce regards as truly instantaneous. It also provides *mediate*, or "inferential" perception of the relation between its own beginning, say, and the ends of each overlapping interval; that is, a mediate perception is spread over intervals. It has an objective aspect, in relation to the object, spread over the four instants depicted above; simultaneously a mediate perception has a subjective aspect, as itself the subject of duration, which is "completely embraced in the second moment [numbers 2-4, above]." Experience is therefore composed of immediate and mediate perceptions as the overlap is grasped as a whole, "for the sum of two infinitesimal intervals is itself infinitesimal, so that it is immediately perceived. It is immediately perceived in the whole interval, but only mediately perceived in the last

[181] Peirce, (1958a), p.38. Emphasis added.

two-thirds of the interval."[182] In consequence time has both thickness, or the extended duration of time consciousness incorporating more than the present, which was to be taken up by Bergson and Husserl, and directionality, due to its asymmetric nature.

Peirce's moments have the overlapping density identified in the Real numbers by Michael Dummett, but they have a great deal more than that, since we are here not thinking only about the abstract continuum, but about a metaphysics of experience in which unactualized possibilities coexist with actualities. The continuum is composed of possible parts, which means that there are no necessary divisions within it, and it can be "cut" anywhere contingency demands. The relationship between possibility and actuality in the context of continuity is expressed by Peirce in his example of the blackboard, as reported by Rosenthal[183]. A chalk line on a blackboard has a certain continuity by virtue of the continuous background which allowed its expression, as well as having discreteness which comes from standing out from that background, with end and edge discontinuities. In turn it too can be the continuity from which further discrete elements may emerge.

There are problems with this view of duration. First, although Peirce's description of time corresponds closely with the non-unified continuum represented by the Real numbers, his inverted triangle and blackboard examples of how continuity works tend to rely on a certain givenness of continuity as a ground for interpretive and cognitive activity. Rosenthal frequently acknowledges the "richness" resulting from the Peircean doctrine of infinitesimals, but she also tends to endorse a view of continuity as simple and undifferentiated, by contrast with the error of all views in which it is "constructed" out of discretes. This ambiguity may be reflective of the presumed givenness, but it is rather in contrast to Peirce's own description, which is complex and suggests a vital role for some degree of differentiation within duration. Hence it seems that the aversion to discreteness is driving the movement towards a simple continuity. Second, the implication is that the internal continuity of moments is something native to time, rather than arising out of wordly activity. There is a direct experience of temporal flow, on this account, due to the characteristics of time itself. Critiquing this view of time would take me too far away from the idea of continuity in itself, though I will be

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[182] Peirce, *Collected Papers*, Vol.6, p.111. Quoted in Rosenthal (2000), p.122.
[183] Rosenthal (2000), p.125.

unable to avoid further engagement with it when I discuss process philosophy later. Finally, Rosenthal seems to have given short shrift to Bergson's own views on duration, to which I will now turn.

Bergson and duration

When David Bohm writes that "Not only is everything changing, but all *is* flux" he is expressing a view of the essence of process which is closer to Bergson than Whitehead. On Bergson's understanding of becoming nothing ever fully becomes, whereas on Whitehead's view becoming ends in something determinable, in principle at least. The difference between them could be epigrammatically described as Bergson's being of becoming, rather than Whitehead's becoming of beings[184]. It is the seeming irreducibility of continuity which makes Bergson's understanding of time problematic for the pragmatic reconstruction attempted by Sandra B. Rosenthal, since it seems to lack the metaphysical power to explain things of pragmatic importance, such as changing objects and the sequential flow of time – this irreducible temporal continuity is called by Bergson "duration".

Duration is not a homogeneous blob of pure continuity, however. Bergson is implacably opposed to homogeneity, which he sees as resulting from excessive abstraction of the everyday, pragmatic sort, but amplified into a metaphysic of a scientific and calculating nature. On this view, homogeneous time is impersonal; it "flows onward, indifferent and void, external to all that endures"[185]. Experienced time, on the other hand, is the transition between the beginning and end of a process, and is intuited as a present unity or duration combining immediate past and immediate future. The necessary role of consciousness in this intuition is uncannily similar to Husserl's analysis of internal time consciousness, which appeared some years after Bergson's first writings in the 1890s. The crucial difference, however, is that Bergson's intuition is not pure Cartesian consciousness. His is a dualism which regards matter and "spirit" as real but differing in degree, not kind, so that perception takes place in the world, at its object (matter), but is always necessarily infused with memory. This "infusion", however, means that it is too simplistic to refer to duration just as a unity, since it must reflect the

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[184] Mullarkey (1995), "Bergson's method of multiplicity." *Metaphilosophy, 26 (3)*, 230-59. p.233.
[185] Bergson, *Matter and Memory*, p.203.

influence of a multiplicity of states of consciousness simultaneously with the intuited unity of the object. Hence duration is a synthesis of multiplicity and unity, and is neither one nor the other[186]. Intuition is in principle susceptible to conscious control, which is able to alter the flow of duration (to "transcend ourselves"[187]) from the very quick, where at its limit all quality of perception is lost and mere quantity of homogeneous matter is encountered in sequential instants, to the very slow, where at its limit is a living eternity.

This heterogeneous quality of duration is very different from Peirce's understanding of time's inner overlapping continuity, since it suggests that duration is not something solely taken up in an act of perception, but rather is something conditioned by entities in the world. When intuition varies its reach to encompass vastly differing durations it is only responding to the world, since in reality there is no one rhythm of duration, and "it is possible to imagine many different rhythms which, slower or faster, measure the degree of tension or relaxation of different kinds of consciousness, and thereby fix their respective places in the scale of being" .[188] Becoming therefore results in beings with differing degrees of duration, which suggests that existence itself admits of degrees[189], and hence the world is an ecosystem composed of beings which blur the line between possibility and actuality. For such beings, duration is an expression of their ability to maintain themselves against, or with, the influence of other beings; in its individuality this ability is their essence. In this sort of world, perception is radically different from the classical story I outlined above – it becomes a matter of responding to the relative invariances in the world in a way which places the old dichotomy of primary and secondary qualities on a continuum of *relative* permanence. Perception does not mean supplementing objective qualities with subjective components, it means subtracting or omitting what is of no interest to our vital functions[190], of "condensing enormous periods of an infinitely diluted existence into a few more differentiated moments of an intenser life…to perceive means to immobilize[191]." My use of

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[186] Bergson, (1946b), "Introduction to metaphysics", in *The Creative Mind* (pp. 159-200). (New York: The Philosophical Library). p.184.
[187] Bergson (1946b), p.187.
[188] Bergson, *Matter and Memory*, p.203.
[189] R.M.Gale (1973-4). Quoted in Mullarkey (1995), p.253. Mullarkey notes that Gale seems to disapprove of this.
[190] Mullarkey (1995), p.250.
[191] *Matter and Memory*, Pp.203-4.

"ecosystem" above was no idle metaphor. The partiality of perception is applicable to all qualities, and in concert with the immobilization of relative invariance, is definitive of Gibson's concept of affordance I introduced earlier. I will develop this relationship in more detail in the final chapter.

Given this understanding of the individuality of duration and the ecological relations enjoyed by durational entities, the temporal continuity uncovered by Peirce makes more sense. Bergson reprises much of Peirce's analysis, but now it is in an appropriate context that links the extended moment to possibilities for creativity and the production of novelty. He says "The duration *wherein we act* is a duration where our states melt into each other."[192] This duration

> of which the flow is continuous and in which we pass insensibly from one state to the other, is a continuity which is really lived, but artificially decomposed for the greater convenience of customary knowledge. Here we see the action issue from its antecedents by an evolution, in such a way that we find in this action the antecedents which explain it, while it yet adds to these something entirely new, being an advance upon them such as the fruit is upon the flower.[193]

Bergson goes on to place duration into a bigger picture evoking a strong hint of Leibniz's monadology: "Matter thus resolves itself into numberless vibrations, all linked together in uninterrupted continuity, all bound up with each other, and travelling in every direction like shivers through an immense body."[194]

It seems that there is some cause for optimism about continuity after all. Duration reveals the possibility of a kind of indivisible continuity which is composed in turn of strands of indivisible continuity. The indivisible strands may be constituents of temporality itself, they may be temporal traces created by a moving agent in a dynamic world, or they may just be native elements of the world. The continuity which they make up is continuous because transition between strands is always mediated. Although this formulation does allow a space for continuity to be imposed by an overarching mentality, whether in an act of consciousness, interpretation, judgement or perception,

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[192] *Matter and Memory*, p.181. Emphasis in the original.
[193] *Matter and Memory*, p.180.
[194] *Matter and Memory*, p.204.

such a move is not necessary. However I should emphasise that what is correct about leaving a space for consciousness is not the nature or role of consciousness itself, but the fact that continuity thought of in an ecological way is always *for something*. It is always in relation to entities, as part of a system of relations, and never purely continuous in itself. That kind of continuity is still just a blob. The kind of continuity which is complex, and which is not just a blob, will be described in more detail in the next section.

3.4 Complex continuity: In-discreteness

The kind of continuity which has emerged in discussion of the real numbers and duration is not a simple continuity. It can be seen to have elements or components, but these are not parts in any traditional sense. Bergson reserves the word "element" for the discrete products of mechanised thinking, from the accumulation of which no understanding of either unity or dynamics can be obtained, and his preference is for "part"[195]; I will follow him in this usage. The continuity can be decomposed, but every such revealed part is itself continuous. It provides a ground which allows the creation of things which are discrete, but it cannot be constructed out of discrete things. It may have fellow structures which fulfil a similar role but in different forms. The term "complex continuity", while apt, is not very illuminating for this kind of structure, since what is at stake is a means of bridging the conceptual divide between discreteness and continuity. In order to emphasise this outcome, I have opted for the term "in-discreteness". The next section will develop this concept further, but before I do this I need to briefly explain what the sense of "part" is that I ascribe to in-discrete and properly continuous things.

I have taken pains to deny proper parts to in-discrete things, so how do such things have parts in the Bergsonian sense? The distinction emerges in consideration of something which is prima facie continuous, say the event of reaching across my cluttered desk to close the window. There are alternative ways to think of the situation when this gesture is not completed as described – either I fail to reach the window latch because my attention is diverted, perhaps by a long-lost pencil, in which case the window-closing gesture becomes a pencil-grabbing gesture; or my action is "cut" or

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[195] Bergson (1946b), Pp.180-1.

interrupted by something which causes me to suspend the action completely without any ongoing commitment to either that action or another act. In the first case it is possible to see my action as part of a family of actions which constitute the counterfactual possibilities associated with that act of reaching, and in such a situation it makes no sense to talk of "a part-gesture" or "half a gesture", since every variation on that gesture is itself recognisable as an intentional act of reaching. This is Bergson's idea of *multiplicity*, or more precisely, continuous or virtual multiplicity. It is, as Deleuze notes, that which divides only by changing its kind[196] – that is, each "alternative" gesture is properly a different gesture. Deleuze differentiates this from a purely numerical multiplicity: "There is *other* without there being *several*; number exists only potentially."[197] Each alternative gesture is, in Bergson's terminology, a *virtual* gesture, which coexists with its fellow counterfactual gestures.

The contrast with the interrupted gesture could not be greater, though by comparison with normal gestures interruption is a relatively unusual outcome. The possibility of suspending the reaching at any point between its start and the window latch reveals only that there is a succession of "reaches", each of which goes further than the previous one, but none of which could be described as a gesture in itself. Instead of a coexistence of virtual gestures there is only the succession of incomplete gestures, none of which is a part of a completed gesture. The sort of division which is at stake here is therefore purely spatial, and the kind of continuity represented by such spatialised acts is that of an undifferentiated unity.

But this discussion has not clearly presented the nature of the parts at issue, since it seems that gesturing is too closely identified with human concerns and the possession of complex cognitive capacities; the examples may seem to be distinguished on a quite arbitrary basis. The feature which is truly distinctive of the continuity of the normal gesture is the absence of a necessary bound, a determinate point at which the act has an end. This "end" is an almost trivially obvious feature of the interrupted gesture. A successful reaching for the window latch would be seamlessly followed by grasping and manipulating the latch and withdrawal of the hand, perhaps to rest on the computer keyboard or begin tapping on its keys. In one sense this is a single act of "closing the

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[196] Deleuze (1988a), *Bergsonism* (New York: Zone Books). p.40.
[197] *Bergsonism*, p.42.

window", and in another sense it is a family of acts or set of parts which fall along the same trajectory. None of these parts exists separately, yet on another occasion they could be separately identified as parts of a quite different gesture. There are two ways to think about their compositional status in this context.

First, in this particular gesture the parts succeed one another, and each can only contribute to the completion of the gesture by virtue of the successful performance of its predecessor. Each part builds on the incremental progress achieved by that predecessor, but in such a way that the transition between parts is not a discontinuity – the successor part takes all the progress made by its predecessor and carries it forward, and there is no sense in which the point of transition can be considered as a bound between parts since the transition has no determinate status. This is a historical or evolutionary perspective, more usually termed a *genetic* perspective, which looks at the coherent lineage of an entity or event, and its parts are all the prior phases which culminated in the completed gesture. I will have more to say about this at the end of this chapter.

Second, the virtual multiplicity is of parts which do not succeed each other but which exist in parallel, as it were. They are more like strands than the parts which they make up. The reaching which becomes a pencil-grasping has an arm trajectory in common, while the preparatory hand movements which would have resulted in a robust window-closing twist become subtly transformed to delicately grip a pencil. Perhaps the same hand, diverted to and engaged by the pencil, then proceeds to now clumsily attempt to grasp the window latch. All these possibilities are pregnant within the original possibilities for movement, and as such their parallel status as strands of possibility exists within their successive status as virtual parts. The "space" within which the strands coexist could be regarded as a logical space of possibilities, though this might encourage one to see each possibility as potentially equivalent, and which in turn could lead to the illegitimate belief that it is the insights of classical probability, based on a space of equi-potent possibilities, which can be brought to bear on the problem. This was emphatically denied by Bergson in his analysis of creativity, of which more later. Since the parts succeed one another at many virtually possible places throughout the space of possibilities, the parallel-ness at issue overlaps in the regions of transition from part to part. It is important to appreciate that the possibilities which coexist are not, in spite of my use of "counter-factual" to introduce them, dependent on intentionality. That

is, they are not simply imaginative projections of possibilities "as-if" I could choose among them to further my individual projects. Instead they are possibilities dependent upon the nature of connection within the space of action – in this case, a space of possibilities constituted by the relations between a multiply jointed, rotatable and extended arm and the low resistance of surrounding air. These together result in an infinite number of "degrees of freedom" which can completely fill a sphere of the space with possible trajectories of motion. These ideas of parthood as genetic, unbounded and overlapping strands have important in-discrete implications.

In-discreteness was invented as a way of thinking about connection, in opposition to separateness resulting from discreteness. It is a principled way of thinking continuity between things which builds on the core meaning of continuity offered by Aristotle, of continuity understood in terms of the absence of a mediating boundary[198], but without subscribing to the usual senses of continuity detailed earlier in this chapter. The first two were senses unhelpful for connection – a *unity* which transcends or combines individual things; and a *sameness* which overwhelms variation. A third sense of continuity does relate to connection, and it is a strong sense in which only the Real numbers are found to be continuous, that is, by being gapless and dense as well as overlapping. What remains after abandoning the unworkable senses of continuity is a different way of thinking about unity as unbounded and composed of parts – this is a view of connection which is not continuity nor discreteness, hence "in-discrete". Two forms can be distinguished, called "overlapping-strands" and "nesting", which can both be applied to part-whole relations (or constitutive connection), and to succession (or temporal connection).

Overlapping strands

Aristotle's minimal form of change, that of mere succession, is a helpful staging post in the development of in-discreteness. When a body of intellectual work is described as "continuous" with prior work it is in the first place because such work is seen as related by succession. Continuity is a legitimate description not because the last word of one piece blends into the first word of the next, but because one or more constituent aspects of the work can be shown to persist from one piece to the next, hence discontinuity is

reduced or eliminated. This in simplified form is the same story I told when presenting the idea of multiplicity. Together, the two aspects of continuity arising from this view – the flow of history, and the overlapping of ongoing strands of constitution – will inform my own understanding of continuity. Continuity as a pure state cannot exist unless the entire universe is made of exactly the same stuff. A less rigorous idea of continuity, of a complex continuity of overlapping strands, allows this absurdity to be side-stepped, but it does not yet address the existence of all the apparent discreteness we take the world to be composed of. There is a variation on the idea of simple continuity which preserves the requirement for unity and provides a connection between continuity and discreteness, while it violates the requirement that there be no breaks. It is necessary to distinguish between the simple unity of an unbroken line, and a complex unity which consists of several lines or strands which exist jointly.

Consider the notion of a unity, a one-ness, a thing - a conventional object like a football team is a unity, but it is not fixed with the same players for ever. What is fixed is the constitutive *role* of each team member, but many players may fill those roles, so the team persists. At any time there may be the grizzled veteran, survivor of many years, alongside the newcomer, and the veteran will have seen many newcomers arrive and gain experience, only to leave and be replaced. Each player's tenure is like one strand in the bundle which makes up the team, and their arrival and departure overlap the strands of the other players and so allow the team to persist. There is a kind of continuity in the team, despite it being composed of different players from season to season, and I call this an overlapping-strands continuity. Each player's tenure, each segment of line, is of finite length, but no discontinuity extends through the entire complex of lines. Here the continuity lies in the overlapping, which is a structural feature separate from the internal role-relations that formally constitute the team, but rather is indicative of the duration (or durability!) of the members of the team.

The later Wittgenstein offers a variation on the idea of continuity understood in terms of overlapping-strands when he considers the nature of conceptual connection. Concepts are tools which are applied with varying usefulness to many different situations, and each time a concept is used it trails along with it a vestige of all its past usages. Each definition in the chain of concepts benefits from its predecessors by largely

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[198] See *Physics*, Bk. V, Ch. 3 as quoted earlier in this chapter.

depending on them for its correct application, but in turn it imposes a cost, due to being applied to new situations in ways that may clash with earlier uses. The way a concept can be linked to its predecessors is likened by Wittgenstein to family resemblance, where no single characteristic links all family members but nevertheless various partial resemblances can be discerned. Hence the "same" concept can assume different forms in different situations, like the concept of "number": he says:

> "Why do we call something a 'number'? Well, perhaps because it has a - direct - relationship with several things that have hitherto been called number; and this can be said to give it an indirect relationship to other things we call the same name. And we extend our concept of number as in spinning a thread we twist fibre on fibre. And the strength of the fibre does not reside in the fact that some one fibre runs through its whole length, but in the overlapping of many fibres."[199]

This is a view of the kind of objecthood which results from multiple overlapping strands having no common start or end, hence no determinate bound can sever all strands to result in a self-contained object.

In-discrete overlapping is a mechanism that allows the "continuum" from fully continuous to fully discrete to exist without forcing the idea of determinateness to take centre stage. On this account, full discreteness would result when all strands are severed at once, or an indeterminately small number of them remain connected. It is the absence of this "continuum of continuity" which bothers the pragmatically-inclined Sandra Rosenthal, since the process philosophies of neither Bergson nor Whitehead seems to supply a satisfactorily nuanced account. On this view, each occupies an extreme position; Bergson says that becoming results in yet more becoming, while Whitehead by contrast has a problematic disjunction between continuous possibility and discrete actuality, which I will explore further in Chapter Five.

Nested continuity

Continuity can be detected as something which unites separate things rather than joins them. It is the continuity of a musical scale or a melody, where the notes themselves are not continuous, but the differences between them are the same or fall into some

intelligible pattern, and the pattern is not given as an instantaneous thing. Here succession is ordered and not arbitrary, applying to the entity as a whole rather than being dependent, like overlapping-strands, on the differing durations of constituents. However the characteristics of duration are also the characteristics of this kind of continuity, which like duration has an essential extendedness which spans any abstracted "instant" and stretches over a "moment" (to use Peirce's terms). Hence it is that the continuous entity or melody carries its history with it and thereby conveys a certain continuity to its environment. This idea will be developed more fully later, but the specific nature of the continuity involved will be outlined now.

The notion of continuity appealed to by my reference to history departs from the original Aristotelian conception of related atomic bodies, and from the usual mathematical description in terms of extensionless points. Instead it looks to irreducible extended entites considered as sets, and manipulates them as pieces of space in which something can travel continuously. These entities are known in classical topology as path-connected subsets of the Real numbers[200]. Hence the core notion of continuity is that of the Real numbers, but it is expressed in the language of part-whole relations, in particular the relation of less-than-or-equal-to (≤). That is, each additional piece of space is greater-than-or-equal-to its predecessor, and there is no gap or discontinuity. Intuitively, this relation is expressing the continuity of what we would call "nesting", where one piece of identified "space" is completely enfolded in another, larger piece. Here is a nested in-discrete image from the writings of Henri Bergson: "Conceive obligation as weighing on the will like a habit, each obligation dragging behind it the accumulated mass of the others, and utilising thus for the pressure it is exerting the weight of the whole: here you have the totality of obligation for a simple, elementary, moral conscience."[201]

A set of Russian dolls nests each within the next-largest, fitting snugly together, so that the next-largest is greater-than-or-equal-to its smaller predecessor. If you consider how a piece of space grows larger, perhaps in the way a ground-covering plant grows as a spreading carpet, then a form of continuity is discernible in the way each new section of space takes up where the previous piece left off and adds to it – the

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[199] Wittgenstein (1953), *Philosophical Investigations (third edition).* (New York: Macmillan) Pt I, §67.
[200] Tzouvaras (1998), "The order structure of continua." *Synthese, 113*, 381-421
[201] Bergson (1935), *The two sources of morality and religion*, (New York: Henry Holt). pp.16-7.

now larger plant completely swallows and contains the previous plant, so an ant could travel continuously from the centre to the growing edge of the ground-covering plant. This is a "nesting" relation, because new growth incorporates but does not destroy its predecessor, or alternatively, because each older piece of plant is nested within subsequent newer pieces. Nesting as a form of spatial containment works in another, non-historical way. The containment is of the smaller within the larger, while the continuity involved results from travel in the direction of increasing size, or perhaps increasing opportunity within an expanding space of possibilities is a way of putting it that links the discussion back to multiplicity. For example, a leaf is attached to a twig, which becomes a small branch, a thicker branch, and eventually a trunk – a path can be traced from the leaf to the trunk which proceeds continuously from the smallest piece of identifiable space to the largest. A tiny rock ledge is part of a boulder, which is part of a buttress, which is one of several outcroppings on a cliff face; in fact, nearly all structures in the natural world can be fitted into related but more comprehensive structures by nesting, and a degree of familiarity with the information available by traversing both up and down such structures is a critical element in environmentally-guided locomotion.

The crucial aspect relevant to "history", and relevant to both formulations of nesting, is that the space of the prior subset is not replaced by a new subset, but is wholly contained within it – in fact, the nature of the new subset largely *depends* on the nature of the prior, now engulfed, subset. This means that following a path up a nesting hierarchy is to follow an in-discrete blend of the immediate past (the smaller piece of space just traversed, which could be readily retreated to), the present (the intermediate piece of space currently being traversed), and the future (the larger piece of space in which the current piece is embedded, and which is being anticipated, or selected). Putting this in different terms, consider how one *phase* of an entity completely succeeds the prior phase and you can appreciate what "history" means if the entity is something like a person.

The drive of history

By "history" here I do not mean to imply any internal dynamic to history which seemingly compels events to occur as part of a transcendent plan; the so-called "historicism" of the Marxian kind. Events are as they are because of prior events in the

histories of the participants in the event, *and* because of the surrounding states of affairs, and the relationship of all these is causal. The view of causal history to be made explicit here has two aspects which involve a dynamic relation between past, present and future. Here the separability of the aspects cannot be complete, not only because past, present and future are in-discretely connected, but also because the aspects are together constitutive of dynamic process: The first pays attention to what *influences* the entity of interest; this mostly implicates the past, so the question of primary interest is "where has it come from?". The second pays attention to what *becomes* of the entity of interest; this mostly implicates the present and future, so the question becomes, "where is it going?"

A temporal relation concerned with origins is called "genetic". When the particular matter of interest is the inheritance of parental characteristics then clearly "genetic" names a tightly-circumscribed sphere of influence dominated by two significant entities. Even here, though, there is a role for so-called "epigenetic" influence not confined to newly-combined chromosomes, and an understanding that much of the genetic influence in fact comes from prior generations. Hence the application of the genetic concept is not confined to the transfer of specifically genetic material, or to the domain of biology. The critical component of the concept is the temporal sequence by which influence becomes concentrated on the current entity – a genetic relation occurs in steps or stages, and the current, culminating entity is the completion of a lineage of progressively concentrating influence. Conversely, a backwards look discloses an ever-widening sphere of relatedness.

An entity which has so emphatically come *from* somewhere does not have a destination at which to indulge in the luxury of stillness. Its current state will not be its last. An impetus which forcefully delivers an entity to the present is an impetus which apparently only arbitrariness or catastrophe could make cease at that point. When I come to look at Whitehead's process philosophy in Chapter Five it will be the apparent necessity for such a halting point which stands out as the pre-eminent inconsistency in the system. Without such a metaphysical pause the lineage keeps on extending, as existence is passed on in an endless game of chinese whispers. The parallel with the well-known game is important, since each "passing on" requires a "receiver" to take up the message and in turn pass it on. This act of receive-and-pass (call it "the present") is constrained by the lineage which has resulted in the message being in a certain form, and is the sum of this genetic influence plus the immediate circumstances. For example, my

desire to have a cup of coffee now, if it was to be a desire counter-factually imagined for the purposes of argument, would not require me to actually like coffee, or to have even tried it – it is an imagined desire I could pluck from the air with the same immediate and ready-made reality as that unicorn there. But *my personal* (addicted) desire to drink coffee now most definitely does represent the working-out of a protracted relationship with the roasted bean, plus a habitual tendency to indulge in such a relationship at about this time of the day. So much for lineage matters. In addition some local, surrounding factors seem to be in the right kind of state to enable coffee drinking – I believe that I have coffee in the refrigerator, that moderately clean cups exist, and that the water will be at or near boiling, plus I am sure that the corridor is relatively unclogged by students and I am capable of walking the few paces to the kitchen. What happens next?

What usually *doesn't* happen next is that I exhaustively tally all the influencing factors and arrive at a conclusion that, yes, I will indeed make some coffee. Instead, I just make coffee. The co-presence of all those factors results in me making coffee, which is not a separate act but simply the culmination of a series of related events. Part of "the present" is a lack, an absence of completion; in this case the lack is a simple desire for the pleasures of coffee, but it is not necessary to think of this lack in terms of addiction and similar sorts of acquired neediness. The incompleteness of the present is the necessary metaphysical lack which demands completion, and this completion can only come from the future. Hence the "drive" of history is not intended to convey an everyday compulsion; either that which results from a specific absence which has its own demands, or which accompanies participation in a transcendent activity, as footballers may be compelled to rush downfield with their fellow players because that is what the dynamics of the game demands at that point. Instead the drive is a driving-through the present, as the wide-ranging influences of the past are concentrated onto a narrowing set of future possibilities.

The nested conception of continuity provides a means of thinking about the way each successive phase of an entity's existence necessarily includes, without discontinuity or gap, all prior phases – the current phase is then the completion of its history. This idea of the accretion of the past is central to the metaphysics of Henri Bergson, who is (not at all coincidentally) the foremost philosopher of continuity. In his work the continuity of past with present is allied with a dynamism which has the effect of driving-through the present moment and "determining" the next moment. This is a

view of determinism which is shared with dynamical systems theory; that is, that the combined effect of history plus current state constrains the future, but cannot be said to fully determine it. There is an essential indeterminism about the production of the future, which for Bergson is explained by will or spirit. For dynamical systems theory the indeterminism is explained by the recursiveness of process, which in a kind of feed-forward mechanism takes the previous phase (which is a continuous state nested within the continuous world, hence able to be characterized, but inadequately, by the Real numbers), and builds a successor phase in an approximation of continuous causal interaction.

In addition, this kind of in-discreteness can also be given an overlapping-strands description, if you think of the space being composed of a bundle of things with varying duration. The advancing wavefront of actuality consists of myriads of "deaths", ongoing becomings at various stages, and "births", and will by its composition be "thick" and irremediably indeterminate. It is a way of characterizing the indeterminacy of the present as being of a kind with the more accepted indeterminacy of the future. Using overlapping strands in this way also emphasises the lack of necessary bounding of each greater-than-or-equal-to extension of the continuous entity – such extensions, as durations, can take any value in a range from the infinitesimally short to the inconceivably long.

To sum up, there are numerous ways to think about and describe continuous connection between things, ways which do not depend on the connection or relation being a construction which approximates continuity by joining together disparate things, or on the things or relata being themselves properly discrete. There are also some significant developments in thinking about reality which implicitly make use of in-discrete principles to investigate connection in domains such as cognitive science and epistemology, and the next chapter will draw out these in-discretions and make them explicit.

Chapter Four – In-discrete Applications

I have spent some time looking at the problematic nature of discrete thinking in philosophy, and in proposing a more productive alternative in the form of in-discreteness. In this chapter I want to extend in-discrete analysis into the world; to investigate its implications for an understanding of the world, and of the place of thought in the world. This discussion will intersect with existing philosophical discourses not usually associated with the contrasting claims of discreteness and continuity – those interested in *holism and externalism*, in which the scope and range of connection between things is at issue (section one), *vagueness and indeterminacy*, in which the precision of relations is at issue (section two), and the character of *mental states*, in which the definiteness of relations is at issue (section three). One outstanding implication of in-discreteness is that it will provide some resources for understanding the nature of indeterminacy, a concept which is too easily dismissed – either assimilated to the better-understood notion of vagueness, or regarded as a invitation to a pernicious anti-realism. Indeterminacy will recur as a feature of discussion about the precision with which thought can map onto the world, as a contrast to the concept of vagueness; and as the natural accompaniment to holism, all of which together defuses the realism-antirealism distinction.

4.1 Holism and externalism

Holism and externalism both seem to be of interest as applications of the idea that influence percolates over networks of relations rather than being confined to discrete entities; in other words, they seem to imply that there are no necessary boundaries. First, let me briefly introduce the idea of holism. Holism, or *meaning* holism to be precise, is characterised by two of its bitterest opponents, Jerry Fodor and Ernest Lepore, as "the doctrine that only whole languages or whole theories or whole belief systems *really* have meanings, so that the meaning of smaller units – words, sentences, hypotheses, predictions, discourses, dialogues, texts, thoughts, and the like – are merely derivative."[202] Holism is contrasted with atomism, the doctrine that semantic properties

[202] Fodor & Lepore (1992) *Holism: a shopper's guide*. (Oxford: Blackwell). p.x. (emphasis in the

are particular to a single entity. Fodor and Lepore distinguish the focus of their collected volume from other kinds of holisms, such as that about confirmation, interpretation, or individuation of functional properties, although one of their criticisms is that arguments for "holism" often do not make this distinction. Further, they worry about the difficulty of quarantining meaning holism from broader questions about epistemology, intentional explanation and metaphysics. I do not share their worry. My aim is not to offer comprehensive surveys of holism and externalism but to propose reasons for preferring a combined holist-externalist metaphysic over any form of Internalism, which will amount to a preference for an explicitly in-discrete approach over an implicitly discrete approach.

According to Fodor and Lepore, one worry holists must face is that the relation of any *part* of a system (language, theory etc) to the whole is in question, as a nonsensical question – it follows, on their view of holism, that no part should exist in any meaningful sense without the accompanying whole. So learning a language becomes impossible without learning it in its entirety, understanding a theory becomes impossible without the understanding arriving in a "single spasm of seamless cognition" in Fodor and Lepore's words[203], and of course providing a simple explanation becomes a lifetime's labour. Or so it seems. A more subtle worry of Fodor and Lepore's is somewhat paradoxical – if the content of thought is holistic (multiply connected), *and* sensitive to the thinker's context, it may turn out that two people thinking the "same" thought may have completely different mental contents. This would make generalising about such content impossible, and hence render a scientific psychology of intentionality impossible. If "the same" is problematic for two people, then it is even possible that mental content from one person-timeslice[204] to the next may differ radically, and if this seems absurd then, on their view, holism is absurd. Fodor and Lepore's line of attack is that they are seeking an argument from the premise that semantic properties are anatomic (shared with at least one other entity) to the conclusion that they are holistic, but their claim is that such an argument does not exist. I don't wish to confront their worries separately, but to show that on my account of holism such worries are defused.

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original).

[203] Fodor & Lepore (1992), p.9.

[204] This concept requires a commitment to a four-dimensional, or "block" universe view of time. See my brief discussion of time later in this chapter.

Now I will briefly introduce externalism. Externalism first became identified as externalism of *mental content*, in the work of Hilary Putnam in particular. His thesis was quite undogmatic, in claiming that *at least some* mental content refers to entities external to the thinker's mind. Putting this another way, the claim is that causal relations in the world can play a role in determining meaning. The reason Putnam's thesis seems so restrained can be partly explained by the strong claim of the internalist position he was critiquing – the claim of internalism is that *all* mental content refers to entities internal to the thinker's mind, in the form of representations which result from transformed, augmented or interpreted input. His triumphant conclusion, "Cut the pie any way you like, 'meanings' just ain't in the *head*!"[205]**,** nicely captures the flavour of this dispute. In this form, externalism is a moderation of an opposing strong position, and this clearly allows for degrees of externality. It is a view that can be accommodated to atomism, as the various forms of empiricism attest; and it is a view which is held to some degree by Jerry Fodor. It can be characterised quite reasonably, if a little misleadingly, as the doctrine that mental content depends on the agent's context, and it therefore doesn't suffer the fate of holism by being given an extreme characterization which caricatures its departure from the strong position of atomism.

The antiholist's worry is that in a holist world there are no principled grounds *at all* for making distinctions, and since they discern the basis for distinctions at every turn, holism must be false. They believe that the most relevant distinction in this case is between one thing and every thing, and there are very good grounds for having faith in the primacy of particular things, as the work of Strawson with which this dissertation commenced attests – after all, we are confronted with objects to which we assign singular names all the time. The intuition that thought and the world are deeply connected in this way goes back to the dawn of philosophical thinking, to the form of The One at the culmination of Parmenides' Way of Truth, as I indicated in Chapter One: The One is still, complete, and tightly bounded. Parmenides-inspired thought is impressed by *discreteness*; the separateness which results from the real being bounded and complete. Discreteness manifests as a respect for categories and absolute distinctions, and a disrespect for continua and relative difference; in a desire to break

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[205] Putnam (1975), "The meaning of 'meaning'." Reprinted in *Mind, language and reality, philosophical papers, volume 2*, (pp. 215-271) (London: CUP), Emphasis in the original.

things down to their atomic constituents in order to understand them; in a preference for sameness expressed as identity rather than resemblance; and in a belief in *essential* differences which make things what they are. Truth as correspondence, and the logical atomism which reinvigorated empiricism, may be regarded as extreme manifestations. Connection, on this view, is a matter of finding a common feature which can be passed from one entity to another, because the entities themselves are inviolable. There is a faith in concepts being defined by necessary and sufficient conditions, and in symbols as carriers of both meaning and structure, and, most recently, a growing faith in information as a bedrock metaphysical concept.

There are some obvious reasons for detecting common ground between holism and externalism. First, in their canonical form they both refer to meaning and the content of thought. Second, each appears to be a reaction to a strongly-opposed position which is susceptible to a shared description; the position that the content of thought is highly *discrete* – in the case of atomism, discrete to an atomic entity; and in the case of internalism, discrete to an individual mind. As Akeel Bilgrami puts it, Fodor apparently believes that meaning and the content of thought are more directly related than they are, which encourages his retreat to atomism in order to prevent what he sees as the only alternative; a slide into rampant holism[206]. Third, each shares a recent lineage involving WVO Quine and Donald Davidson, and owes more than a passing debt to a third enigmatic figure, Ludwig Wittgenstein. Interestingly, none of these writers made strong claims to either of the terms "holism" or "externalism"[207]. I will start by drawing a holist metaphysic from the work of Wittgenstein, then move on to briefly sketch Quine's holism, which largely leaves such a metaphysic unsaid. In the following section I will use Donald Davidson's holism to illustrate links with externalism and indeterminacy.

Wittgenstein and Quine

Wittgenstein was terribly interested in the way everything was connected, and in his early work was struck by the crystalline clarity with which the interdependence of things can be thought as a whole, as my use of the early sections of the Tractatus to convey the

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[206] Bilgrami (1995), "Review of A Theory of Content and Other Essays; and Holism: A Shoppers' Guide." *Journal of Philosophy, 92 (6),* 330-44.
[207] Though Davidson uses both terms in his later writing.

discrete but composite nature of facts reveals. Thanks to his early interest in Schopenhauer's concept of will he struggled against the lure of solipsism, which is an extreme form of internalism. In solipsism the internality of experience is taken to its logical conclusion – that nothing exists except myself, and in particular my mental states. Wittgenstein's refutation of this position centred on his arguments against the possibility of a private language.

Wittgenstein starts in the *Tractatus Logico-Philosophicus* (1922) by pointing out that the world is not primarily made up of things, but of arrangements of things into facts, and this leads immediately to thinking of logical thought and the world as being connected by their structure - he says (TLP, 2.013) "Every thing is, as it were, in a space of possible atomic facts. I can think of this space as empty, but not of the thing without the space." The very idea of independence is rethought; he says (2.0122) "The thing is independent, in so far as it can occur in all possible circumstances, but this form of independence is a form of connexion with the atomic fact, a form of dependence." Every thought needs embedding in a matrix of activities and other thoughts in order to be made sense of - (3.13) "To the proposition belongs everything which belongs to the projection; but not what is projected ... In the projection, therefore, its sense is not yet contained, but the possibility of expressing it." What makes this sense meaningful is the fact that a totality exists into which it fits: (3.42) "Although a proposition may only determine one place in logical space, the whole logical space must already be given by it..." He goes on to point out the formative role this overall structure has on its components, and the extent to which each element owes its role to the sum of all others: "...The logical scaffolding around the picture determines the logical space. The proposition reaches through the *whole* logical space."[208]

In the Tractatus Wittgenstein gives us a number of pointers to a subtle way of thinking about "things" not as elements of reality in their own right, but as elements by virtue of the place they play in the arrangement of all other "things". The closer you get to the things, the more they become mere placeholders for a particular conjunction of influences and powers. One significant cost of this way of thinking is that the "whole" has a certain closure; it is conceived as a completed unity, and it is the difficulty, if not the impossibility, of this kind of act which Fodor and Lepore exploit in their critique of

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[208] Emphasis added.

holism. In addition it is a static, changeless unity. One unlikely benefit is a new understanding of subjectivity in this relational, boundaryless reality, a denuded subjectivity close to Kant's transcendental ego. Interdependence undermines a strong role for a personal centre of consciousness, a metaphysical subject or "I", which will be a larger theme in Wittgenstein's later work, while at the same time it reserves a place for that form of consciousness as a node in the web of relations with its own unique perspective on that web. This, he says, near the end of the Tractatus, is what is correct about solipsism (5.64) "Here we see that solipsism strictly carried out coincides with pure realism. The I in solipsism shrinks to an extensionless point and there remains the reality co-ordinated with it."

The later Wittgenstein of the *Philosophical Investigations* focuses more philosophical attention on the nature of connection itself, and away from the structure within which connection does its work. The effect, however, is to open the structure, introduce the possibility of change, and diminish the extent to which the "whole" need be conceived as a unity. Consider an object like a football team, which I introduced earlier. There is a kind of continuity in the team, despite it being composed of different players from season to season, and I earlier called this an overlapping-strands continuity. Wittgenstein offers a variation on overlapping-strands continuity when he considers the nature of conceptual connection, and here he offers the image of a rope, as I also noted in the previous chapter. This is a view of the kind of unity which results from multiple overlapping strands having no common start or end, hence no determinate bound can sever all strands to result in a self-contained object. It is also, in its boundary-dissolving, an element in Wittgenstein's attack on the idea of a mental "inside" being essentially different from an "outside", which I will return to. Boundary dissolving of a different sort was Quine's entry to holism, to which I now turn,

The boundary Quine attacked was a fundamental distinction made famous by Kant – that there are some elements of mental content which owe their true status *necessarily* to other wholly mental elements rather than the world. These *analytic* elements are therefore true a priori and statements based on them can stand alone; eg, "the angles of a triangle sum to 180 degrees". *Synthetic* elements, by contrast, depend upon experience, and statements based upon them require support from other statements. The result of the dissolution of the distinction between analytic and synthetic statements is that no statements gain indubitable power by virtue of being analytic, just as no

statements are indubitable by virtue of their direct sensory content – this is confirmation holism; or as Quine says "Our statements about the external world face the tribunal of sense experience not individually but only as a corporate body."

Quine goes further (according to Fodor and Lepore's reconstruction of his argument) when he urges that the significant unit of confirmation is no longer the single term, not even the statement, but the whole of science. And the final plank of the argument is to claim that the method of confirmation of a statement just is its meaning. This view results, in the hands of later defenders of holism, in a picture of a theory as a sort of network, in which statements are the nodes and their semantic relations are the paths connecting the nodes. The meaning of a statement is its position in the network, and to take this image seriously, Fodor and Lepore comment, is to apparently believe that *any* change in a theory necessitates changing the value of *all* the statements. To accept this interpretation would seem to commit one to a certain narrow view of the nature of such a network that could result in its resistance to change: first, that the posited relations between nodes are rigid, and therefore immune to deformation; and second, that the nodes themselves are tightly-bounded, such that rigid relations can firmly connect to them and maintain the integrity of the overall structure. This is a vision of holism seen through the prism of discreteness. It is not a diagnosis that is applicable to an in-discrete analysis, as the following section will show.

Holism, relational ontologies and in-discreteness

The most obvious point of congruence between formulations of holism and in-discreteness lies in the lack of respect for apparently necessary and obvious divisions between things. In most cases the formulations do not extend beyond a circumscribed sphere such as conceptual knowledge or scientific theorising, but it is constitutive of such formulations that there not be a crisply-defined boundary around the domain of applicability – one cannot quarantine holism without risking absurdity, Fodor and Lepore's concerns notwithstanding![209] Second, and related, is the strong emphasis on the connections between holistic elements, since it is connection that makes the holism possible. In both Quine and Wittgenstein, though more explicitly in the former, this

[209] Having said that, I do not intend to provide an argument for "holist" holism separately from my account of process philosophy later in this work.

conjunction of connection without division comes with an added dimension of strength or intensity, understood in two ways. First, there is an understanding that with increasing distance from a given node in the network of relations there will be some diminution of the strength with which other nodes give and receive influence. Second, even allowing for equality of "distance", not all nodes are equal contributors to the influence on any given node – as Wittgenstein says in the example used already, some uses of the concept "number" are more directly linked to the canonical definitions than others; while Quine would allow that some concepts are more fundamental than others, and neither of these ways of thinking about varying strength of connection is a threat to holism.

Two related concerns about the diminished status of the individual can arise out of this view of massive interdependence: One is that it may prove impossible to characterise such an individual; and the other is that individuality must be lost in favour of the presumed totality. In response to the first worry, Akeel Bilgrami directs his attention to Fodor's all-or-nothing depiction of holism as providing no resources to characterise individual mental content at all[210]; Donald Davidson does something similar by emphasising the sociality of linguistic practice, rather than mental content[211]; Jeff Malpas moves to calm worries over a form of scepticism which is claimed to be endemic to holism – a scepticism about the nature of self-knowledge[212]; and finally Wittgenstein's metaphysics gives us the resources to sensibly distinguish the individual from the whole[213]. I will present these responses in turn before turning to briefly discuss the second worry, that the very idea of an individual is at risk in a holist metaphysic.

Fodor's concerns about the possibility of completely unique mental content undermining the project of a scientific psychology are akin to the belief that the only alternative to discreteness is full continuity, in the terms I introduced earlier. In other words, if a theory of meaning is like a pot of vegetable soup, one dip of the ladle may contain no parsnip while the next is dominated by it, and therefore no explanation which depends upon correctly characterising the parsnip content of a typical ladle can be true, because there is no typical ladleful. Bilgrami seeks to defuse this worry about the

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[210] Bilgrami (1995).
[211] Davidson (2005), "The social aspect of language." in *Truth, Language, and History* (pp.109-25) (Oxford: OUP).
[212] Malpas (1994), "Self-knowledge and scepticism", *Erkenntnis, 40*, 165-84.
[213] Hacker (1972). *Insight and illusion: Wittgenstein on philosophy and the metaphysics of experience.* (Oxford: OUP).

directness of the relation between a theory of meaning and the content of an individual mind by introducing a distinction between such a theory, which would have global relevance by virtue of its all-encompassing nature, and a *locality*, or grouping of minds, in which, *in practice*, some meanings will tend to have salience over others. People in a community of interest have the full theory of meaning available to them, but tend to use a characteristic subset[214]. Although those who aspire to explanations with universal application will find this troubling, I note that Nancy Cartwright offers a similarly localised view, but of science, in *The Dappled World*[215].

Davidson offers a more complex account, but in a similar vein[216]. He is responding to the conventional view that the existence of a language is conceptually prior to its application in use by speakers, and while the motivation for his emphasis on use can be found in Wittgenstein, its application is characteristically his own. Putnam-style externalism, he points out, can be easily accommodated by proposing that speakers *believe* in a canonical set of true meanings grounded in expert opinion, and this is a form of internalised "externalism" favoured by Fodor[217], For Davidson, far from there being any internalised norms or rules of application, the imperative for speakers is to be understood, and this imperative complements the radical interpreter's desire to understand[218]. A successful relationship between speaker and interpreter is therefore a *local* relationship which is not necessarily separated from the holistic network of meaning relations, and which constitutes an idiolect rather than a language. Users of the idiolect do their best to ensure that their meaning is understood, with the necessary collaboration of their interpreters. On this view it is not plausible, as conventional externalism would allow (according to Davidson), that words may possibly have a meaning of which *both* speaker and hearer are ignorant.

This formulation of Davidson's externalism goes some way to addressing a concern that it opens the door to the most pernicious form of scepticism, which is that we may not truly know the contents of our own mind. It provides this limited deflection of such a scepticism by grounding meaning in the local hurly-burly of collaborative

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[214] Bilgrami (1995). It would be unnecessarily ugly to attempt a soup version of Bilgrami's solution. Pie is a better choice, at least in the way every segment includes part of the centre!
[215] Cartwright (1999) (Cambridge: CUP).
[216] Davidson (2005)
[217] See his *The Elm and the Expert* (1994) (Cambridge, MA; MIT Press/Bradford Books).
[218] There will be a fuller discussion of Davidson's holism in the next section in relation to indeterminacy.

communication, which results in clarification and correction of meaning externally and in real time, as it were, and in doing this it locates externalism against a background of holism. Conventional externalism seemingly only shifts the focus from the external world to our own minds – as Davidson says "Our ordinary beliefs about the external world are (on this view) directed onto the world, but we don't know what we believe"[219].

The claim of self-knowledge scepticism arises in part because the very definition of what counts as "our own" seems to be in question for critics of externalism, and partly because of a worry that severing the link between truth and causal determinants removes the possibility of firmly grounding our beliefs about the world, which initially opens the door to external-world scepticism. Jeff Malpas addresses these criticisms together by pointing out that, if scepticism is indeed to be a feature of externalism then on Davidson's view it cannot be quarantined to the usual scepticism about the external world, since (by the operation of an idiolect, just given) to know about the world we need to know about the contents of our own minds, but to know about the contents of our minds we need to know about the world. Hence scepticism must be stronger still, and rather than putting in question *either* the external-world *or* self-knowledge, it must include both. This suggests that externalism by itself is not a route to anti-scepticism about self-knowledge. The answer, says Malpas, is to take holism more seriously, which Davidson's critics have apparently failed to do. Although the holism emerges in consideration of interpretation, as in the idiolect context discussed above, it must be taken seriously as an ontological thesis and not just an epistemic one, since "There is no fact of the matter concerning mental states independent of the holistic interconnections exhibited in the project of interpretation."[220] The very interdependence of knowledge of self, others and world banishes the possibility of serious error *and* serious doubt, since there is no "outside" standpoint from which to judge the veracity of any one component of knowledge.

My final part of the story about the relation between holism, externalism and in-discreteness comes from Wittgenstein's assault on the fixity of the inner-outer distinction. This was not meant to be a denial of the existence of the inner, or a claim

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[219] Davidson (1987) "Knowing one's own mind". Quoted in Malpas (1994), p.168.
[220] Malpas (1994), p.172.

about the heightened epistemic access to be gained by paying sensitive attention to the outer. Recall that in the Tractatus the special inner nature of the "I" was reconceived as a limit or an extensionless point, a significant place in a structure, akin to Kant's transcendental ego. The issue addressed at greater length in later work was the extent to which the *nature* of the inner content must differ essentially from what lies outside it. Such an "I" can only "own" elements of the structure, which are as open to the world as it is, by interacting with those closest to it, since there is no boundary between it and them which demarcates the private inner from the public outer. Such a thinker cannot possibly be, in Patrick Hacker's words, "one whose concepts, rules and opinions are *essentially* unshareable, rather than contingently unshared."[221]

In this regard the argument against the possibility of a private language shows that for inner content to have any meaning it must be constituted by the outer – that is, since meaning constituting and meaning consumption (or encoding and decoding, if you like) are complementary aspects of the same activity, then even the possessor of a privately encoded language, were it to exist, would be unable to understand it. Hence it is an argument concerned more with privacy than with language as such. The absence of a necessary boundary is not, however, an invitation to omniscience, since some form of localisation must still come into play – the self has those limitations on its interactions with its surrounds I introduced above when discussing the convergence between in-discreteness and holism. Such limitations result from the necessary diminution of powers with distance, and from the influence of other constituents of the world. Together these limitations are experienced as a horizon, an ever-changing zone within which are those graspable items entitled to be called "mine".

These thoughts may reassure sceptics that a holist metaphysic can indeed provide the resources to characterise in-discrete individuals, but they may not fully allay concerns of the second kind about individuality that can be directed at the sort of relational ontologies I have been considering, and here I should include Spinoza's metaphysics as taken up by deep ecology. The second kind of concern is that a relational emphasis leads to a totalising One or Unity which crushes or overwhelms the individual. This is clearly a worry motivating Fodor and Lepore's argument with holism, and the answer lies in a return to that principled distinction between an individual node and all

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[221] Hacker (1972), p.222, emphasis added.

other nodes which can be so easily lost when holism is considered. Wittgenstein leaves an ineradicable place for an individual centre of personal consciousness, though he labours to dissolve any necessary boundary which separates its interior from its exterior. Arne Naess, influenced by Spinoza, invokes self-realisation, or perseverance in one's own way of being, as a core constituent of all individual nodes, though "somehow" this "widening and deepening" of individual selves never makes them into one "mass" and prevents a progression into mystical Oneness. He is unable to explain this, and ruefully adds, "It is a meagre consolation that I do not find that others have been able to do this in their contemplation of the pair unity-plurality."[222]

These responses may seem a little glib, however the concern about loss of individuality is rarely expressed as much more than a worry based on a misunderstanding of holism. Naess' situation is a little different, as his work is a manifesto for change which is informed by holism and which explicitly includes a move away from individualism. If the debate is to be conducted at the level of discreteness of individuals competing with continuity of the "mass" then by definition no reconciliation of the positions will be possible. However if in-discrete connection is considered then a principled compromise seems possible, since intensification of connection is constitutive of individuals, and such individuals will always have the strongest connection to their own past states, as well as weaker connections to other things. For living individuals boundary-maintenance activities will act to sharpen the discontinuity between inner and outer, between individual and environment, but they will never be completely successful in achieving a closed autonomy. The next section looks in more detail at what it might mean for individuals to not be as crisply-defined and determinable as we would like. It looks at the presumed failure to precisely describe reality, due to vagueness in language, and weighs this against the possibility that reality simply is not in a state amenable to unique description, due to indeterminacy.

4.2 Vagueness and indeterminacy

The previous section revealed that holism is an established concept which dovetails neatly with an in-discrete view of connection, and which enables talk of mutual

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[222] Naess (1989), p.173.

interdependence to proceed without privileging either the individual or the totality. In the work of Donald Davidson holism also has broader implications for an understanding of how the world is. In this section I look at a philosophical discourse which has a lot to say about what we *say* about how the world is, the discourse of vagueness, and which some would like to extend to the world directly. One implication of in-discreteness, as I have been presenting it, is that belief in the distinctness, completeness and determinateness of objects of all kinds is undermined. To some commentators this emphasis on indeterminacy may seem to bring in-discreteness close to the much better documented concept of vagueness. This section will start by looking at vagueness to distinguish between the epistemic and linguistic type on one hand and ontological forms on the other, followed by a look at how vagueness in the world has been treated, before discussing the implications of Davidson's model of holism for indeterminacy. The conclusion will be that indeterminacy is not the same as epistemic vagueness as it is primarily ontological. Further, hopeful talk of "ontological vagueness" is misguided, as the vagueness concept does not provide the metaphysical tools to get to grips with an indeterminate reality. The distinction between indeterminacy and vagueness is clear once one realises that indeterminacy does not imply a lack of precision, but only the absence of uniqueness.

Vagueness

It is to be expected that there is no one clear definition of vagueness, if you take the word itself seriously. According to Dorothy Edgington[223] the notion of vagueness has much in common with the idea of uncertainty of beliefs. In both cases there is an apparent absence of a fact of the matter, and this can lead to problems when an attempt is made to elucidate the "fact" by progressive clarification. In the vagueness literature "fact" means an objective situation which makes a description uniquely true, and to the extent that a belief in vagueness is associated with a belief that a precise description of that fact is in-principle possible, then the holder of such a belief is a realist. It is not the clarification, but the very existence and nature of the fact which is at stake in the

[223] (1997), "Vagueness by degrees". In *Vagueness: A reader* (Ed. Rosanna Keefe & Peter Smith, pp 294-316). (Cambridge, MA; MIT Press/Bradford Books).

distinctions between epistemic and ontological vagueness, and between vagueness and indeterminacy, as I will show.

In the case of descriptions, the term “bald” is unproblematic when applied to a man with zero hairs on his head, and clearly wrong when used to describe presidential hopeful John Kerry. Troubles arise when clarification of just what “bald” *really* means is attempted by progressively refining the definition, and this is easily done, from either end of the hairiness scale, by unproblematically adding (or subtracting) a hair. A bald head plus one hair is still bald, a hairy head minus one hair is still hairy. Each individual increment fails to threaten the bald/hairy description. Unfortunately, after a few million iterations of impeccable logic we discover that the now hairy head is still entitled to the descriptor “bald”, while the now shiny dome is still entitled to the descriptor “hairy”. We have been led astray by the Sorites (or “heap”) Paradox. “Bald” is a *vague* term. We are led astray by our belief that there exists a determinate point, before which it is nearly certain that “bald” is a true description, and beyond which it is nearly certain that “bald” is a false description. There is a maddeningly ill-defined point at which "bald" should cease to be true. This point, the existence of which is the focus of my interest in vagueness, is the so-called “borderline” case which is said to be so distinctive of vagueness.

The way borderline cases operate can be clearly seen in the baldness example. It is obvious that the possessor of the shiny dome and the possessor of quite a large number of hairs which nevertheless struggle to hide their shiny dome will both fit comfortably into the category “bald”. Conversely, John Kerry, and the possessor of a similar hairstyle minus the aforementioned large number of hairs will both be regarded as hairy. The trouble arises in that intermediate zone when the descriptor “bald” doesn’t quite seem to fit, and it is here that the borderline cases occur. Two different ways of thinking about this intermediate zone exist, with different logical implications, though they are symmetrical. One way says that someone in the zone is *neither* bald nor not bald - in other words, the zone represents a *gap* between the way “bald” and its complement can be applied, hence “truth” does not apply to any cases falling in the gap. The other way says that such a person is *both* bald and not bald - in other words, “bald” and its complement overlap, leading to a so-called *glut* where being “bald-and-not-bald” results in too many “truths”.

Notice that I have actually introduced two different ways of thinking about vagueness in the course of the baldness example, though they are not usually disentangled. The first was the notion of difference by degrees, which allows a sorites-style argument to progressively lead us by unimpeachable premises to a paradoxical conclusion. The second was the absence of a special tipping-point, resulting in borderline cases, which is a way of problematising just *some* of those differences. The former approach, in the view of Otavio Bueno and Mark Colyvan[224], gives a purer vision of vagueness because it is not beholden to either of the alternatives which an emphasis on borderline cases must confront – a commitment to either gaps or gluts.

I mentioned in the first paragraph that vagueness operates in the realm of linguistic description, and everything that followed apparently reinforced this. Vagueness resulted from trying to say or think *about* things, and it was an exact characterisation of the thing which proved impossible to clarify satisfactorily. The borderline cases approach tends to group together cases with seductively clear applications: Those surely in ("bald"), those surely not in ("not bald"), and the borderline cases which are disputable. Here, the surety of most descriptions is acknowledged while space is left for commonsense uncertainty. Of course the borders of the borders will then be in dispute, and so on, so what this process reinforces is the epistemic and linguistic nature of the vagueness in question, and the enduring belief that there might exist a particular point which marks the border in question – the vagueness is seemingly part of our knowledge about the world, and how we struggle to capture it in words, not about the world itself.

Is there vagueness in the world?

Rather than thinking about vague *descriptions* of things, it may seem that there actually are vague *objects*. Mount Wellington, for example, is uncontestably itself right at the summit pinnacle, but somewhat less clearly so several kilometres from the summit further down the ridge towards Chimney Pot Hill. It is true that we could think of "Mount Wellington" as a vague description, but unlike a head with a determinate number of hairs, or a colour sample with a determinate wavelength, there simply does not seem to be a fact of the matter about where Mount Wellington becomes Chimney

[224] Unpublished manuscript.

Pot Hill. A progression of difference by degrees can be constructed linking the two features. Is the descriptor "Mount Wellington" an example of epistemic vagueness which is accurately responding to truly ontological vagueness?[225]

Belief in vagueness in the realm of linguistic description does not commit its believers to any position on the nature of the world. Many subscribers to linguistic vagueness also believe in a crisply-defined world, which it is nevertheless beyond our powers to capture in anything other than a vague way. This perspective, of a certain cognitive fallibility, is quite compatible with the borderline cases approach to vagueness, since it allows regions of relative infallibility around the “True” and “False” ends of the continuum and confines the confusion and error to the borderline cases. These, it is hoped, can be refined and defined-away (or “precisified”) to a minimum. A similar method of reducing cognitive fallibility operates in the case of apparently vague mountains, and other objects whose status depends on the assignment of some value by people. For mountains there is a geographical convention which regards the lowest point between them as a "saddle", which is therefore neither one peak nor the other – a truth-value gap, literally. Since a conventional description is in this case refinable by further conventions, I would regard the vagueness of a mountain as only apparently ontological.

This apparent mismatch between language and the “real” world is operating all the time, and is seemingly inevitable. We now know, thanks to chemistry, that apparently solid surfaces are full of holes, while quantum physics tells us that the “holes” and their surrounds are probabilistic manifestations of short-lived subatomic particles. Bertrand Russell argued that precision (as he saw it, the converse of vagueness) was a one-to-one mapping of the phenomenon onto a symbol, and this was achieved by getting closer and closer to the phenomenon, progressively reducing the many-to-one vague mappings, though never actually reaching the perfect mapping. Vagueness considered in this way cannot be eliminated.

A different way of thinking about the determinability of borderline cases results in a more realist view of the probable existence of ontological vagueness, but about which nothing can be said. Michael Tye proposes a three-valued semantics which respects the indeterminism of borderline cases, to the extent that a property is vague if there is no determinate fact of the matter about whether there *could* be objects that are

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[225] Thanks to Richard Corry for complicating my simple illustration of vagueness.

neither instances, borderline cases, or non-instances of it. For Tye, this would be a consequence of the world being "in certain respects, intrinsically, robustly vague..."[226] A similar kind of noncommittal realism informs Terence Parsons and Peter Woodruff's defence of the very idea of vague identity, an idea earlier demolished by Gareth Evans' famously short paper "Can there be vague objects?" They conclude that "genuine worldly indeterminacy of identity is perfectly coherent" but "whether there actually is genuine indeterminacy of identity is something that we think is presently not settled."[227]

However there does seem to be some support for the idea of an ontological vagueness which is properly reflected in, rather than forever hidden behind, linguistic and epistemic vagueness. The approach of focussing on difference by degrees denies the relevance of borderline cases, which have proved to be such a focal point for analyses of linguistic and epistemic vagueness. Rather it "opens the way to an understanding of vagueness as a uniform phenomenon", as Bueno and Colyvan modestly put it. Taking vagueness as "a uniform phenomenon" means at least seriously entertaining the possibility that the world is vague, in some as yet unknown sense, since it requires the vagueness formerly quarantined into the problematic borderline cases to be spread out along the spectrum of all possible cases. At the very least this means that there comes a point where vagueness is no longer reducible by cognitive means, even though nothing can be said about what that "irreducibility" amounts to. Even Russell, who famously argued that vagueness was essentially a linguistic matter, nevertheless also believed that it was ineliminable, even from the apparently precise realm of logical connectives[228]. Anything which is so deeply implicated in such explicitly precise (that is, intentionally non-vague) thought must, to anyone but a full anti-realist, be indicative of some relation

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[226] Tye (1997), "Sorites paradoxes and the semantics of vagueness", p.293. In Keefe & Smith, pp 294-316).

[227] Parsons & Woodruff (1997), "Worldly indeterminacy of identity", In Keefe & Smith, p.321. These two papers come from a landmark 1997 collection called *Vagueness: A reader*, and represent the strongest statements there in support of ontological vagueness. A 2004 vagueness collection, edited by J.C.Beall, makes no reference to it.

[228] (Russell, "Vagueness", 1922 lecture) "Words such as "or" and "not" might seem, at first sight, to have a perfectly precise meaning: "*p* or *q*" is true when *p* is true, when *q* is true, and false when both are false. But the trouble is that this involves the notions of "true" and "false"; and it will be found, I think, that all the concepts of logic involve these notions, directly or indirectly. Now "true" and "false" can only have a *precise* meaning when the symbols employed --- words, perceptions, images, or what not --- are themselves precise. We have seen that, in practice, this is not the case. It follows that every proposition that can be framed in practice has a certain degree of vagueness; that is to say, there is not one definite fact necessary and sufficient for its truth, but a certain region of possible facts, any one of which would make it true. And this region is itself ill-defined: we cannot assign to it a definite boundary."

to the world. This view therefore allows that linguistic description works as well as could be expected to capture a world which is in varying degrees vague, though this is a conclusion that Russell himself vehemently denied. Putting it another way, if talk of vagueness is *indispensable* to understanding the world, then this indispensability is itself an argument in favour of ontological vagueness.

Vagueness as difference by degrees says nothing about the world directly. In avoiding the need to think of descriptions as necessarily falling within a given categorical boundary it opens a door to understanding vagueness as arraigned along a continuum, from the fully distinct at one extreme to the fully indistinct at the other. Bueno and Colyvan offer as a strength of their formulation the ability to construct sorites-type progressions which elucidate many vague things in surprisingly many productive ways. Such progressions, unlike the strictly numerical progression which marked the progress of the bald-to-not bald hair-counting exercise, need not be totally ordered, but can be partially ordered. That is, some progression must be apparent along a given path of ordering, but it need not be the only possible path. The existence of multiple possible paths for ordering is to be expected when the objects connected are not numbers, since numbers themselves have only one identifying (and identifiable) feature. Bueno and Colyvan give an example of compositional vagueness, where the vague term “religion” can be applied to potentially many quite different things. A crude path linking "religion" to "non-religion" can be constructed; eg Christianity, Buddhism, Brazilian soccer, Australian Rules Football, schoolyard kickabouts. Of course each stage is arguable, but the trend is obvious; there are features in common, perhaps more than one, which enable a similarity relation between adjacent elements in the series. While the entire series may be informed by the degree of religiosity to be found in each element, connections between adjacent elements need not be totally subsumed under this head. This solution seems quite compatible with Wittgenstein’s account of the family-resemblance relation between concepts, and for many of the same reasons - it too sought to undermine our intuitions about the clarity of supposedly necessary distinctions between things.

A prototypical example of a vague object is a cloud - it is "fluffy" with indistinct boundaries; another could be a cat - it too is fluffy with indistinct processes of fur-exchange with its surrounds. There is some physical fact-of-the-matter which denies us the possibility of making firm determinations about the fluffiness in question, and

here increasing precision cannot result in a reduction of vagueness. Bueno and Colyvan's partly-ordered sorites speaks to a similar kind of ineliminable vagueness, one where the nature of the boundary is a consequence of the composition of the "object" in question. They note that some writers refer to this as "multidimensional vagueness", with the crucial factor being the impossibility of reducing the orderings to a single dimension. The question now is, in what does this ineliminable vagueness consist, and is it really vagueness anyway? This is where in-discreteness and the concept of indeterminacy may help. My claim is that everything is in-discrete, which is potentially analogous to the claim that everything is vague, but I would rather say that it is *actually* analogous to the claim that everything is indeterminate. This is due to my insistence that no "thing" has the discreteness and determinacy apparently demanded by attempts to sharpen predicates, which is the usual route to solving puzzles about borderline cases – in-discreteness will inevitably result in a multiplicity of determinations about the nature of a thing.

Overlapping strands can represent the duration of elements of reality or the concreteness of persons in a sporting team – the key idea is that unities exist as unbounded collectives, marked by the arrival and departure, or birth and death, of individual components, whose coming and leaving does not threaten the collective's existence. This form of in-discreteness manifests as the inability of any single end-point to sever the entire collection and bound it, hence a kind of continuity persists. The consonance with the compositional or multidimensional vagueness of Bueno and Colyvan's partially-ordered sorites linking religion with non-religion is very strong, and the connection with Wittgenstein's family-resemblance even stronger. Nesting is a more subtle manifestation of in-discreteness, possibly closest to a temporal vagueness in character. It concerns transitions between states, such as occurs in the phenomenon of growth or the passage of time. Here a successor state incorporates in its entirety a predecessor state, with some infinitesimal addition; in other words, a progression of difference-by-degrees.

Now although I have given each of the manifestations of in-discreteness a description which links it to characterizations of vagueness, I think that this is potentially misleading. In-discreteness, I claim, is how the world works – it is the proto-structural form of connection between things and events in the world, and it works this way because neither things nor events are discrete. Vagueness as a concept works best

when cognitive activity, including representation, is considered as separated from the world, and is therefore necessarily unable to connect precisely to it. Hence vagueness as it is usually conceived is an epistemic concept. To summarise, it refers to our carefree use of terms such as "bald" to describe a range of real-world situations, many of which are unambiguously correct and some of which are arguably incorrect. Vagueness is regarded as problematic when the term is used in a sorites-style, differences-by-degrees chain of reasoning which results in a paradox of contradiction. If the differences cannot be totally ordered in a numerical form, say by adding or subtracting one thing, then a partial ordering along at least one among multiple paths may be possible. This way does not lead to contradiction, since the partial ordering is by resemblance, not strict identity. At this point, where some theorists may wish to pursue an argument that vagueness is also "in the world", they have recourse to little more than an indispensability-style argument, and vagueness itself gives them no further purchase on the matter. Indeterminacy is a more powerful concept, and I turn now to look at it in more detail.

Indeterminacy

Whereas vagueness as a concept refers mainly to the shortcomings of a subject in mapping a symbol onto an object, indeterminacy refers more directly to the object, in *resisting* the assignment of a definitive mapping. A partly-ordered, difference-by-degrees relation between concepts, and a fluffy cloud, share something – they both lack the clear boundary which might allow a precise one-to-one mapping. The lack of precision is not accidental, it is constitutive of each object, and it makes the object something indeterminate. There are two ways to think about this indeterminacy that are not fully compatible: The first, and most immediately appealing, is that objects themselves are indeterminate, in their innermost being as it were – that is, that the existence of objects is probabilistic thanks to the chancey, fleeting existence of their fundamental quantum constituents, and this makes objects inherently fuzzy and indistinct. At our usual scale of operation the indeterminacy of such objects, this version would have it, is irrelevant, and we function perfectly well by assuming that objects are fully determinate. Some people with highly-trained cognitions, the adepts, or physicists with large pieces of equipment, may be able to perceive ultimate, flickering reality, but the remainder of us cannot. On this view, misunderstanding and semantic confusion

arise because of the differing cognitive skills and experiences of the language players, and "indeterminacy" is just another name for vagueness, which can be resolved through better descriptive practices, or is an outcome of arbitrary boundary-fixing (for example, "bald").

The second way to think about indeterminacy, not so intuitively attractive because it is a little more complex and not so immediately a consequence of "our best science", is to consider that the very idea of objects, and what it means to be objective, is problematic. This is the position I will adopt. On this view there are stable configurations at varying levels of organization, some of which map closely onto objects and many of which do not. Describing and using these configurations are skills that are possessed unequally by all agents at all times, since description and skills depend upon particular circumstances. Further, objects may have a provisional, relative nature rather than a timeless truth, due to the dynamic contexts in which they are embedded, hence unlike the first view they cannot have a precise description that suits all occasions. Indeterminacy on this view is a by-product of in-discrete connection, even if it were true that objects themselves were to be discrete.

The view that reality is composed of objects and the relations which connect them is the dominant position in philosophy – call this view "substantialism", deriving from the central role accorded, mostly implicitly, to notions of substance. The alternatives look to *events* as the prime constituents of reality, and an immediate attraction here is that events seem not to have obviously distinct start and end points – that is, they appear to be unbounded and in-discrete entities. Examples of event ontologies are the work of Martin Heidegger (though this is disputable), Donald Davidson, and process philosophies of all kinds. It is characteristic of such theories that object and subject are dissolved or called into question as discrete categories of reality – they are conceived either as mutually constitutive elements which can nevertheless be regarded from their own perspectives, or as elements inextricably joined in a single process.

It is a crucial aspect of event theories that since the elements of their ontologies do not have a discrete nature, this means that to some extent their content is spread over a range of entities, or is shared with other entities, along the lines of the overlapping-strands in-discreteness I talked about earlier – these theories therefore tend to be inclined towards holism rather than atomism. Although the theory may have a

story to tell about what "objects" are, such relatively discrete entities are not the starting point for theorizing. Instead the impetus comes from some sort of temporally-oriented process – in Heidegger's later work it is (arguably) the process he calls "*Ereignis*"; for Davidson it is "triangulation"; and for process philosophers such as Whitehead it is what he calls "happening" or becoming. I will use Davidson's work to illustrate the path from holism to indeterminacy, as this connection has already been introduced in the context of holism.

Davidson's holism starts with the world, since for him meaning is secondary to truth, and truth depends on relations with the world. Holism is said to be a feature of these relations because of Davidson's interest in the bare requirements of linguistic understanding, which he develops as a theory of "radical interpretation". In Jeff Malpas' words, this "is a matter of interpreting the linguistic behaviour of a speaker 'from scratch' and so without reliance on any prior knowledge either of the speaker's beliefs or the meanings of the speaker's utterances."[229] The radical interpreter is forced to utilize the actions and contexts of the speaker as the starting point for understanding their meaning; and actions and contexts, like events, tend to blend seamlessly into other actions and contexts. The public grounding of meaning in this way is bound up with the intrinsic sociality of language.

Beyond the in-discreteness of actions and contexts, and the appeal to sociality, it might be difficult to fully appreciate where the holism and indeterminacy lie in this, but the key is the process adopted in interpretation. A critical component of this is the *principle of charity*, which is broadly the requirement to treat speakers as if they are making sense and holding true beliefs; and here meaning and truth intersect. Davidson, in "Three varieties of knowledge", considers the way knowledge of the world, knowledge of other minds, and knowledge of ourselves are irreducibly different, yet intimately related. Although each is irreducible to any other, all are grounded in truth, and truth gains its meaning through the linguistic practices of interpersonal communication. In such communication, possession of a thought is necessarily individual, but its content is not. Consequently the distinctions between the three

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[229] Malpas (2005), "Donald Davidson". *The Stanford Encyclopedia of Philosophy* (Summer 2005 Edition).

varieties of knowledge – subjective, intersubjective and objective – are not essential differences based on the content of the thoughts pertaining to each realm[230].

Although the holism emerges in consideration of interpretation, it must be taken seriously as an ontological thesis and not just an epistemic one, since as Malpas notes of Davidson, "There is no fact of the matter concerning mental states independent of the holistic interconnections exhibited in the project of interpretation."[231] The very interdependence of knowledge of self, others and world banishes the possibility of serious error *and* serious doubt, since there is no "outside" standpoint from which to judge the veracity of any one component of knowledge. What is at stake is the nature of the fit between thought and world, the nature of the connection. In a holist conception of the world there are multiple paths to the thought, multiple partial orderings that connect world and concept in a variety of continua. The holism here arises because no one path is the best, or the most correct, or the truest – the holism arises because other paths are *always* possible. Belief in a necessary boundary between thought and world, and associated discreteness of both mental content and objects, reduces this spread of possibility to a narrow window of psychophysical actuality which is reconceived as necessity, and makes a search for truth a search for just one thing. The existence of multiple orderings results in an essential inability to "objectively" specify that special one thing.

The absence of a particular and unique relationship between a state of affairs and a description is often glossed as there being "no fact of the matter", which formulation ambiguously combines both facts and the matters they refer to. The contrasting view of a holistic multiplicity can seem a lot like vagueness, since it is the apparent difficulty of resolving "the fact" into something precise which seems to be the problem. It leaves the door open to a kind of Kantian humility about the essential limits of reason in grasping reality – an example of this kind of thinking can be seen in Leemon McHenry's defence of process plurality against Strawson's view cited at the start of this work, that material particulars are the basic ontological elements: McHenry asserts that "the essence of reality will always elude the grasp of a language designed to

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[230] Paraphrase of Davidson (2001), "Three varieties of knowledge", in *Subjective, Intersubjective, Objective* (pp. 205-220) (Oxford: Clarendon Press). p.218.
[231] Malpas (1994), p.172.

describe static objects in various spatial relations."[232] Against this, what needs to be re-emphasized about the multiplicity in question is that it is not a static entity, but an event, and as an event its start and end blend into other events and its internal structure is dynamically unfixed. Hence rather than a "no-fact" stumbling block to precise description, the more correct characterisation is that there are "too many facts" available. The result is indeterminacy, not vagueness, since each act of communication can be just as precise as the participants need it to be, but necessarily no single act can precisely map on to a fully objective world. Associated with this sense of "not fully determinable" is the sense in which "indeterminate" has a causal implication, and means "not fully determined"; for this overtly causal application "indeterministic" seems a more appropriate, though confusingly similar, term[233]. This aspect will be discussed in more detail in the next two chapters, which will be informed more particularly by process philosophy, so these comments will be brief.

Each event, whether an act of communication or physical interaction, is compositionally in-discrete, thanks to the overlapping strands of reality it encompasses; in particular, it is durational, in the terms introduced in the previous chapter. This means that all the elements of the event coexist even though they do not share a common start, and more importantly, they will not share a common end. Regardless of whether the content of the occasion is intentional or physical, any given moment in duration is "thick" with the causal influence of the immediate past driving it towards a raft of possible futures, none of which is fully determined. It is in this sense that in-discreteness dovetails with pragmatism, with its orientation towards the future: As William James says, "But philosophy is prospective also, and, after finding what the world has been and done, and yielded, still asks the further question 'what does the world *promise*?'"[234]

It is clear that what we normally take to be "vagueness", about such things as colour terms or baldness, results when the range of partial orderings is relatively large and divergent, while the domain to which they apply is relatively static. There is no fact of the matter that *actually matters*, even if a measure of wavelength or a count of the number of hairs were to be available, but instead massive overlap in shared usage results in generally effective communication. Indeterminacy, on the other hand, results when

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[232] McHenry (1992), *Whitehead and Bradley: A comparative analysis*. (New York: SUNY). p.108.
[233] The associated states are therefore "indeterminacy" and "indeterminism".
[234] James (1955), p.75. Emphasis in the original.

the range of partial orderings is relatively large and divergent, while the domain to which they apply is similarly divergent and dynamic. Here there are too many facts applicable to too many matters. Scientific precision results from tightly-defined shared understandings of the components of the scientific enterprise – the intentions of the actors which inform their scientific behaviour, the boundary conditions for events, the identification and classification of those events, and the communication of features of the events. The remaining indeterminacy may well be described as uncertainty or randomness – but that is another story well beyond my scope.

Indeterminacy is a feature of all three varieties of holism considered here. In reverse order – Davidson's radical interpretation obviously allows multiple versions of the "truth", although in practical terms some will be more useful than others. For Quine, holism of verification is symptomatic of indeterminacy for much the same reason – that there can be no ground for saying which of two "glaringly unlike" translations of individual sentences is correct[235], but rather the set of sentences which constitute rival theories are judged as a whole. Wittgenstein's holism changed from a belief in the necessity which binds the whole determining the correct logical placement of the parts (that is, something akin to Fodor and Lepore's caricature of holism), to the possibility of multiple paths between parts. This led him in his last writings to consider the implications of this multiplicity. When a potential infinity of gradations of facial movements can be fitted into one concept, say "smiling", this tells us something significant about the world. There is no defined set of gestures which can be mapped onto the concept – as he says, there is ""smiling that is smiling, and smiling that is not."[236] What sort of cognitive apparatus would a creature capable of making sense of the difference between a smile that is and one that is not have to possess? On traditional accounts of cognition the family of similar facial expressions would be found to possess necessary-and-sufficient conditions such as micro-features which define the smile-versus-non-smile distinction, and the typical analysis of these features would result in assigning a given expression to a discrete "Smile" category. In the following section I will consider some recent moves in cognitive science which propose alternatives to

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[235] Quine (1994), "Epistemology naturalized", In *Naturalizing epistemology* (2nd. Ed, edited Hilary Kornblith, pp.15-31) (Cambridge, MA: MIT Press/Bradford Books). p.23.
[236] Wittgenstein (1992), *Last writings on the philosophy of psychology. Vol.2: The inner and the outer*, (Oxford: Blackwell). p.81e.

traditional accounts, and it will be apparent that these accounts depend upon in-discrete characteristics.

4.3 In-discrete cognition[237]

A prominent expression of discreteness in current work is the central place accorded to symbols in cognitive science, the shortcomings of which I discussed in the previous chapter. As I indicated there, a powerful alternative to symbolism can be found in the discipline of ecological psychology, built in particular around the account of mutuality which I presented in some detail. A more general account of system behaviour that has emerged in response to the shortcomings of discrete thinking is dynamical systems theory (DST). This section will look more particularly at the application to cognition of DST and of connectionism, which is a particular application of DST instantiated in neural networks. Both of these approaches profess to be offering not just an alternative, but one which has naturalistic, and in particular biological, credentials that make it applicable to a wide range of phenomena. A different sort of alternative is that which looks at cognition in an everyday sense, from the perspective of its possessor or "user" rather than an objective scientist - this is a loose body of self-consciously commonsensical wisdom known as Folk Psychology (or FP), which must be either rejected or to some degree assimilated by any more reductive theory of cognition.

One manifestation of FP as understood by philosophers is in the sentence-like statements of mental content called Propositional Attitudes[238], and these have been a focus of theories of representation including symbolism. Analysts of FP (and many of the folk themselves) have noticed that our understanding of our own mental life cannot be completely reduced to Propositional Attitudes. In particular, much of our mental life seems, to us, to violate discreteness in many ways. We have intense feelings which seem to fade gradually, or merge gracefully into quite different mental states. We have thoughts and memories which seem to lose their strength. We seem to be able to hold

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[237] This section, except where otherwise acknowledged, is based upon the author's contribution to a jointly-authored paper which is not currently published. See Mitch Parsell & Bruce Wilson (under review) "Discreteness, in-discreteness, and the character of mental states".

[238] Propositional attitudes are simple statements that couple a psychological concept (a belief, desire, intention, urge, fear etc) with an object for that concept, and they usually take the form exemplified by "Bruce fears that the dog is dangerous", where "fears that" is the *attitude* towards the *proposition* "the dog is dangerous".

opinions with variable degrees of certainty. We have existential crises and moods which do not seem to have a clear "object". We follow connections between concepts which may leap, then slide, then minutely inch us from one thought to another. The kinds of experiences captured under the head of FP can be continuous or cyclical, brief or extended, incomplete, suspended, abandoned, blended, diffused, subject to figure-ground reversals, context-sensitive, so faint as to almost defy description or so overwhelming as to make it unnecessary. All of these can give pause to an explanation based upon discrete symbol processing, and all can give some encouragement to the alternative sources of explanation which eschew discreteness.

One of the aims of in-discrete cognition is to make cognitive modelling less foreign to the commitments of FP, while recognising that FP principles can support a number of inconsistent theoretical positions. In this regard the proposed in-discreteness seeks only to nudge cognitive modelling away from the manifest unnaturalness of discrete symbols. My purpose here is not to argue for a particular theoretical position but rather to reiterate the range and power of an in-discrete analysis by comparison with the restricted range of discrete theorising. Bearing this in mind, in-discrete cognition has a clutch of premises that inform its development:

Comment [G1]:

Comment [G2]:

(IC1) Objects and events in the world are not fully discrete;
(IC2) Representation is ecologically valid; that is, it respects the way the world is; and, as such,
(IC3) Objects of representation (whether considered as content or state) are not fully discrete.

In-discrete Cognition has the following characteristics. These points will be familiar by now so not all of them will be expanded upon; however I will devote some space to discussion of the features which make connectionism and dynamical systems theory in-discrete in relation to cognition:

1. Representational unities are possible as unbounded collectives. This respects any phenomenological "indistinctness" that FP may attribute to objects of thought, though without committing me to explain whether these objects are concepts, beliefs or attitudes. It is also consistent with the view of concepts as modal rather than

bounded, and as related by family-resemblance rather than identity;

2. In-discrete representations enter into all (or almost all) aspects of cognitive ecology. I do not want to deny the possibility that fully discrete objects have a necessary role somewhere in the thickets of the cognitive jungle;

3. At their limit such representations influence other unities in nonlinear, irregular ways. The idea of a highly-distributed neural net allows us to think of representational objects as many-dimensional competitors for cognitive resources, and to thereby respect FP understandings of such things as cognitive conflict, vacillation and indecision, and forgetting;

4. In-discrete representational unities are characterised by their constituent parts having different durations with various start and end points. Hence (i) their "overlapping strands" nature means that a determinate bound is unlikely to exist, therefore (ii) discreteness will manifest itself along a continuum of discontinuity, depending on the extensiveness of the commonality of start-end points; and,

5. In-discrete representational unities are available for "nesting", where one object is wholly taken up within another in a topological relation that *approximates* continuity. Nesting refers to both the way in which one historical phase succeeds another for a particular object, and the way in which one object can be incorporated into another.

Points One and Three, the existence of unbounded unities that influence each other in nonlinear ways, are the primary foci for the differences between discrete (symbolic) representation and in-discrete cognition. One aspect of Folk Psychology that has received some analytic attention is the phenomenon of gradual forgetting, which does not seem compatible with the nature of symbolic representations and discrete transitions between states. Eric Schwitzgebel would like to use this shortcoming against the idea of representation in general (against the Representational Theory of Mind, or RTM) but here I will be much less controversial. Schwitzgebel has argued that "[f]or any proposition p, it may sometimes occur that a person is not quite accurately describable as believing that p, nor quite accurately describable as failing to believe that p." Call these states "between beliefs"[239]. Consider, for instance, the case of gradually forgetting a person's name. Take someone you knew well when studying as an undergraduate; call her Lynne. At this stage of life, you have no problem recalling this

[239] Schwitzgebel (2001), "In-between believing.", *Philosophical Quarterly, 202*, 76-82. p.76.

person's name. Now suppose names fade quickly for you. By the time you have finished your postgraduate study you need prompting to recall the name. Not that you have forgotten anything about this person, as you would have no difficulty recognising her, and that would bring back her name instantly. Finally, suppose that you are finishing up your distinguished academic career, and while cleaning out your office you notice a familiar woman walk by. You don't really recognise her – you certainly don't recall her name and seeing her does not bring back any specific memories – but she does produce a feeling of deja vu. The person is Lynne, but this fact is lost to you forever: meeting her will not bring back her name, indeed, even if she where to tell you her name it might not sound familiar.

In the above example, we have two extreme stages of recall. During your undergraduate years recalling Lynne's name was no problem, even out of context and without her present. By life's end, the ability to recall Lynne's name is completely lost and cannot be brought back by probing. It seems highly implausible that at some stage between complete recall of the name and complete failure of recall there was a discrete moment before the name was absolutely present and after which it was absolutely absent. If this is correct, then it seems that there must be some point in the process of forgetting where one is *in-between* recall and failure of recall. Extending this to beliefs—for example, the belief that S is named Lynne—suggests there are "beliefs" in-between believing and failing to believe. Schwitzgebel claims that the RTM can only offer a plausible account of non-discrete mental states if it is sensible to talk of vague representational states. But he dismisses vague representations as incoherent. I have shown that the descriptor "vague" is most appropriate for a discrete account of representation which requires precise mapping of internal symbols onto external events, so it follows that vague *representations* are only incoherent on a symbolic account of representation. If one accepts the possibility of non-symbolic content then it will often be legitimate to characterise a system as being in a vague (or, more strictly, in-discrete) representational state – as not quite accurately describable as representing that p, nor quite accurately describable as failing to represent that p.

This example may give an impression of in-discrete cognition being exclusively "cognitive" by its focus on memory, but it is constitutive of in-discrete cognition that there be no fundamental distinction between outer-directed sensory components of perception and inner-directed cognition. In the loosest possible terms,

this amounts to overlapping strands of sensory data, motor system accommodation and intentional activity all interpenetrating dynamically in a single perceptual process. It is constitutive of the standard view of perception that such elements be kept separate, and this allows a strong distinction to be maintained between the supposed continuity of sensory input and the presumed discreteness of mental states and categories. Continuous sensory input is said to be "nomically-coupled" (in lawlike ways) to sensation-driven representations by the cognitive scientists Eric Dietrich and Arthur Markman, who were my protagonists when discussing simple discreteness in Chapter Three. Their view of continuity is based upon the Real numbers, but it is not the sophisticated understanding of Real number continuity detailed by Michael Dummett[240]; rather it contrasts a "gappy" definition of discreteness with gap-free continuity. Hence for them "continuity, in one important sense, means that there is just one unified entity."[241]

It should be clear by now that Dietrich and Markman's restricted view of continuity has blinkered their vision. By strongly distinguishing between the nomic coupling of sensory systems and the non-nomic discrete representations of higher thought, they presume too much. The nature of sensory systems is to be collections of specialized sampling devices with massively interacting capabilities, so any nomically-valid continuity which results from their operation must be considered at the level of a population of such devices. Further, there will be sub-groupings within each population which, at any time, will be specialising in a particular aspect of the sensory environment, which is why we talk of "peripheral vision", "deep pressure", "sour" and so on. So it makes no sense to impose a narrow definition of continuity on the operation of such systems, since they clearly do have functional parts and structure when considered as a population. Representations resulting from such parts will readily decompose and combine in an in-discrete fashion by the interleaving of their constituent strands. Further, nesting of sensory output would seem to allow the possibility of a prior "sour" experience being contained within a subsequent "deep pressure" experience as an unripe fruit is bitten, and in this combination, without even venturing into the landscape of conceptual thought, the possibility of creative emergence of concepts is foreshadowed.

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[240] See Chapter Three and Dummett (2000).
[241] Dietrich & Markman (2003), p.101.

Hence a strong distinction between nomic/continuous and non-nomic/discrete cannot be sustained.

I will now look briefly at the in-discrete credentials of connectionist and dynamical views of cognition, not with the intention of defending them as accounts of cognition, but only to highlight the extent to which they differ from discrete accounts and potentially embody in-discrete principles.

Dynamical systems theory

The most radical alternative to the belief that there exists a necessary barrier between agent and world utilises dynamical systems theory to refigure the very idea of cognition, and I will briefly describe this and its implications. The starting point is a respect for change as a fundamental feature of the world, which was a largely implicit element in the previous section but which achieved great prominence in the earlier account of ecological psychology. Evolutionary theory has infected other disciplines with an increased respect for the mechanisms of change and its ubiquity. But the wider implications of dynamics have not been fully appreciated – as David Bohm says "Not only is everything changing, but all *is* flux. That is to say, *what is* is the process of becoming itself, while all objects, events, entities, conditions, structures, etc., are forms that can be abstracted from this process."[242]. Bohm's words introduce the idea of process and becoming in contrast to substance and being, which I will discuss in much more detail later, but in this context they serve to highlight differences in the understanding of time.

The dominant view of time in the philosophical and physics communities dovetails neatly into discrete thinking because it proposes an external, atemporal perspective from which time and space are seen as forming a four-dimensional object – the 'block universe'[243]. Just as in a concrete block, in the interior of the 4-d object nothing moves, and there is no 'forwards' or 'backwards'. Any time in the history of the universe can be found by slicing into the block; this "timeslice", depending on its thickness, represents an event with real duration as experienced by the creatures living in

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[242] Bohm (1980), *Wholeness and the implicate order*. (London: Routledge).p.48. Emphases in the original.
[243] See Huw Price (1996), *Time's arrow and Archimedes' point: new directions for the physics of time.* (New York: OUP).

the universe at that time. However in spite of my mention of thickness there is an expectation on this view that infinitesimal timeslices or *instants* are the fundamental constituents of the 4-d universe. Such slices are discrete and stand-alone, since there is never a suggestion that a time slice might have an equivalent property to a pizza slice, where strands of cosmic mozzarella cheese might drip and stretch between adjacent slices. Our experience of time passing, and of causal influence proceeding in one direction only, are illusory. Our belief in the intuitive power of time's asymmetry, says Huw Price, is "anthropocentric"[244].

In contrast to this atemporal perspective, which takes quantum physics and general relativity as its guide to reality, dynamical systems theory (or DST) is strongly influenced by those unabashedly anthropocentric disciplines chemistry and biology – instead of highly abstracted views of isolated particle interactions, it is founded on the understanding of how masses, or ensembles, of entities behave together. Dynamical systems refers to a perspective on the behaviour of physical systems that has developed from its roots in chemistry to encompass systems in all areas of enquiry. Historically, Newton's work led to the growth of a mechanistic view of nature, which could be analysed by considering time as a sequence of instantaneous states linked by deterministic laws[245], which is the progenitor of the block universe conception. This resulted in three problematic attitudes towards the understanding of the world: (i) System behaviour which departed from the mechanistic ideal was considered to be error or noise; (ii) the world was analysed in terms of discrete and discontinuous states; and (iii) interaction between states was only explicable in purely mechanistic terms, by summing the states in a linear fashion.

Nineteenth century preoccupations with the concept of evolution and the physics of irreversible processes led to the belief that nature evolved towards the randomness of high entropy; the so-called "heat-death" of the universe. This sat uneasily with Boltzmann's thermodynamic analysis of the mass behaviour of vast numbers of atoms, which resulted in the idea of an equilibrium between the competing states of such atoms. A reconciliation of sorts was achieved when the chemical properties of catalysts

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[244] Price, p.4. It is apparently not anthropocentric to have arrived at this rationalist conclusion using cognitive skills unavailable to the nonhuman remainder of the universe. Alternatively, the atemporal or 'God's-eye' perspective does seem to significantly trump mere anthropcentrism.

[245] Prigogine & Stengers (1984), *Order out of chaos: Man's new dialogue with nature*. . (London:

became known – these molecules dramatically change the course and dynamics of a reaction but are themselves regenerated through the course of the reaction. Two concepts of fundamental importance resulted from these observations: the idea of feedback, when the output of the reaction itself provides fuel and new components for further reaction; and the idea of a chemical system *not* achieving equilibrium, but instead exhibiting qualitatively different states as it is pushed further and further from equilibrium.

The behaviour of fluids is a problem for classical dynamics, which attempts to model a liquid as a collection of individual molecules. "Turbulence" describes the apparent disorder of a liquid under gravitational or thermal duress, and it is characteristic of turbulence that it arises unpredictably out of more ordered behaviour, and it exhibits a complete absence of order in the terms of classical dynamics. Turbulence epitomises what is now called *chaotic* behaviour. Just as chaos can arise out of ordered behaviour, so too can order be seen to arise out of chaos. A pan of boiling water may settle into a regular rolling pattern from centre to periphery after a period of chaos. Another example is in the apparently random behaviour of a mass of commuters surging through a busy railway station, which from above initially appears like milling ants or darting smoke particles. Such behaviour is the result of myriads of actors following the simple rule "Get to my platform quickly", and with experience the view from above may be seen to resolve itself into recurrent surges of commuters in, and then out, of the station, like a series of waves, as trains arrive and depart. In an everyday sense even a normal decision-making process can be interpreted as a period of chaotic oscillation between possible choices followed by settlement onto one actual choice.

The mathematical formalism of algebra is used to describe the way the system adopts some of its possible states in turn as it goes about its business. Descriptions tend to be in geometrical terms, graphing the system's trajectory through its phase space. The *phase space* is defined in terms of the number of dimensions necessary to describe the system's behaviour, and this approach is scalable from 3 neurons up to entire brains, depending on the degree of abstractness of the dimensions[246]. The structure of a system's phase space could be an aspect of the ontology of systems, but for many (perhaps most) commentators dynamics is seen as an

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Flamingo). All historical references to dynamics in this section are from this book.

[246] See Churchland & Sejnowski (1992), *The computational brain*. (Cambridge, MA,: MIT Press).

issue of epistemology only. An example is the mathematician René Thom, who introduced the analysis of catastrophes as sudden changes of a system's state. Thom appears to subscribe to the view that the qualitative, graphical techniques of dynamic systems are primarily an aid to understanding, with comments such as "…what matters most for everyday use is almost always a qualitative result and not the precise value of some real number.", and "One essential feature of our use of local models is that it implies nothing about the 'ultimate nature of reality'; even if this is ever revealed by analysis complicated beyond description, only a part of its manifestation, the so-called observables, are finally relevant to the macroscopic description of the system.".[247]

However the insight that interesting dynamic systems lurch between states with varying levels of stability depending on the level of input and the influence of other dynamic systems is a fundamentally *structural* insight. I say "lurch", but this gives a misleading impression of ungovernable randomness. Some configurations in phase space are relatively regular, and the system can be seen to reliably adopt certain forms of behaviour. These regularities, towards which a system is evolving, are known as "attractors", and the teleological flavour of this term is no accident, since it turns out that many such attractors are surrounded in phase space by a set of configurations, called the "basin of attraction", which tend to channel or direct the system towards the attractor state. Some systems evolve to a particular state and stay there (so-called "fixed-point" attractors, such as a resting-state or minimum energy condition, for example a dangling pendulum); others adopt a cyclical lifestyle (periodic, or limit-cycle attractors, such as planetary orbits); and some systems with more than one relatively stable state may indeed lurch from one state to another in ways which defy precise prediction and control (the so-called "chaotic" or "strange" attractors). The actual physical substrate of a system is essentially implicated in its behaviour, and instead of being digital and discrete, physical substrates are analogue and continuous. This has some significant implications for describing and understanding their behaviour, and suggests a number of ways in which the growing understanding of dynamical behaviour is recapturing some of the elements which previously made substance such an attractive centrepiece for reality. Before turning to this I will discuss the question of analogue versus digital.

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[247] Thom (1975), *Structural stability and morphogenesis: An outline of a general theory of models.* (Reading, MA: W.A.Benjamin), pp.6-7.

An analogue system is not just an old-fashioned precursor to a digital system, though the marketing of telecommunications gadgetry would have you believe otherwise. Analogue things operate in real time, not clock time; that is, they are continuous. What continuous means here will be taken up in more detail later in this chapter. For now, think of the continuity of the Real numbers – the important thing is that there is no point during the continuous operation of a thing which could not be described by a Real number[248]. Compare this with something operating according to clock time – its state at each "tick" can be precisely defined, but there is nothing which can be said about what happens between the ticks, during the smallest intervals of time the clock records. There are two ways continuity operates in conjunction with analogue things. The first is where chemical and biological processes that are composed of millions of components in fact operate in-discretely as evidenced by oscillation between states – the in-discreteness results from the overlapping transition from one state to another, which operates gradually and in piecemeal fashion en route to a total transformation, and also in the nested way each state succeeds its predecessor as the oscillation proceeds in an essentially circular manner without apparent end. A stunning example from inorganic chemistry is the brightly-coloured Belousov-Zhabotinsky reaction, in which two chemicals are combined in the presence of a catalyst, and in which temperature and stirring, as well as the concentrations of the three chemicals, can be varied. Depending on these parameters, different forms of "auto-organization" can be observed, such as a chemical clock (recurrent, speedy transitions), stable spatial differentiation, or the formation of waves of chemical activity over large scales[249].

The second, and more subtle, manifestation of continuity is seen in attempts to force some apparently simple continuous systems to adopt a discrete mode of operation, which demonstrate chaotic behaviour arising from deterministic processes. These attempts reveal the startling effects that seemingly trivial differences in the way the system's initial state is characterised can have, with very small starting differences resulting in hugely different outcomes. The following example speaks to the inherent continuity of action, and in particular to the impossibility of discretely characterising the

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[248] I am equivocating about what "describe" means here, since an actual physical number may in fact not be assigned to any given point without truncating the string of numbers after the decimal point. Such a number is *in principle* assignable. The impact of truncation is demonstrated later in this section.

[249] Prigogine & Stengers, pp.152-3.

bounds of the action, particularly its "start". Such impossibility is a species of indeterminacy.

Demonstration of sensitivity to initial conditions: This example looks at modelling Real numbers on a calculator, and the major effect that a tiny difference in the way those numbers are truncated has on the evolution of the system. The equation is the logistic equation, a "growth" equation related to the formula for compound interest: $p + rp(1-p)$. This is a continuous function, in that it can conceivably take any value. It is forced to adopt a pseudo-discrete operation because Real numbers must *always* be truncated in practise, so a precise characterisation of an analogue system is never possible. With the constant r=3 and an initial value of p=0.01 the equation is iterated many times (ie, the result is fed back into the equation). The comparison is between truncation to 10 decimal places, and truncation to 3 decimal places following an interruption – these options could be seen as merely differing degrees of *accuracy* in characterising the starting point for the system's operations, however this very minor change results in a huge difference after 100 iterations.

The part of the string common to both processes is underlined, and the critical truncation step is highlighted[250]. Notice that it takes fewer than ten further iterations for the two processes to diverge noticeably.

Iteration	Without interrupt (truncate to 10)	Interrupt, truncate to 3 & restart.
1	0.0397	0.0397
5	0.1715191421	0.1715191421
10	0.7229143012	0.7229143012
10	0.7229143012	0.722
15	1.270261775	1.257214733
20	0.5965292447	1.309731023
30	0.3742092321	1.333105032
100	0.7355620299	1.327362739

[250] Taken from Peitgen, Jürgens & Saupe (1992), *Chaos and fractals: New frontiers of science*, (New York: Springer-Verlag). p.48.

Although these dynamical processes could be given a description in which spatial dimensions predominate and time just "falls out" as an independent variable, that would be too easy a rejoinder to the view of time inherent to the block universe, and somewhat misleading as well. The truth is that the concept of "space", thanks to the algebraic analysis that supports it, has become so general that mere extension is inadequate to describe it, and temporality has become so deeply embedded in space that on the dynamic view it "out-blocks" the block universe! The rhetorical appeal of the block universe is to an intuition that time is, in many respects, like space (for example, just as we can he "there" at that place we can also be "then" at that time[251]), and according to this intuition separating time out for special treatment is logically unjustified. The reason that plumping for the more complex description is beneficial is that an algebraic understanding of space results not in a merely four-dimensional view of reality, but in a multi-dimensional view. On this richer view change manifests as "movement" within phase space, without the need to invoke a specifically temporal dimension to either understand or describe the change. Temporality does indeed fall-out as an independent variable, not because it is irrelevant or conceptually downstream of other variables, but because it is the passive by-product of fundamental change – on this view time is an epiphenomenon. Getting to grips with the nature of this change is part of the project of replacing a discourse based on discrete elements (instants of time, in this case), with something more generally applicable to the metaphysics of connection. If responding to change is anthropocentric in the way Huw Price thinks our experience of time is, then any understanding of reality that grants a place for change is apparently anthropocentric!

Dynamics and substance?

The appreciation, thanks to dynamical systems theory, that structural features play a significant role in shaping large-scale behaviours of systems, has reconnected modern insights to historical intuitions about substance. Recall that, by the end of Chapter Two,

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[251] However it seems to be immune to counterexamples based on the failure of the analogy – we can reidentify and revisit "there" but we can do neither to "then".

substance metaphysics was found to embody some critical features of a continuous metaphysic in spite of being historically mobilised to support discreteness: the indissoluble relationship between constitution and intelligibility that characterises individual substances (Aristotle), the notions of act or energy (Aristotle, via Aquinas), continuity as real divisibility or intensity (Spinoza), and continuity as density or connectivity (Leibniz). Historical substance took the boundedness of objects as primary and necessary, but DST reveals a richer notion of boundary, one that results in an understanding of a boundary as contingent, unstable, partial and permeable. This includes not only the material boundary conditions mentioned in preceding paragraphs, such as physical structure, temperature, stirring and concentration, but also more abstract "boundaries" such as the characterisation of a start point and the nature of transitions between phases, both of which Bergson incorporated into his concept of multiplicity. Changes to all of these can threaten the viability (or identification) of an entity. These considerations speak also to my interest in developing an ecological characterisation of the entity, which I flagged at the end of my discussion of ecological psychology, and which I will return to in the final chapter.

I have moved a long way from the problematic cognitive science idea that the brain is a closed system, but I hope to have shown by this devious route that the discrete thinking that encourages such an insight is seriously lacking in credibility. It lacks credibility because (i) it assumes an essential boundary between the inside and outside of the body, and (ii) it assumes that time is an independent variable like space. The countermove to both of these is to demonstrate the plausibility of a degree of continuity rather than the assumed discreteness, which the following discussion of in-discrete cognition will attempt to do.

Dynamical cognition

I have already introduced DST in general, so my comments here will be confined to cognition. There is an interesting conjunction of interests between DST and ecological psychology due to the notion of "coupling", which is a fundamentally in-discrete activity because it refers to the orderly connection of two or more things into a new temporary unity. The early use of this concept by James Gibson expressed the general mutuality to be found between organisms and their environments thanks to the processes of

evolution. Later researchers realised that a crucial determinant of an organism's ability to utilise affordances is the coordination between its variously jointed and extended limb segments, and to the extent that attached limb segments behave like oscillating machine components they became known as "coupled". Ecological psychology has subsequently split into two major camps, one concerned with such things as environmental cues for motion like optic flow, and the other with the fundamental mechanisms of movement control. This latter group were early adopters of the mathematics of DST as they mapped the movements of coupled oscillators and discovered regularities in their performance.

I mentioned in my earlier overview of DST that structural concerns were central to its analysis, and a crucial aid was the concept of phase space, which depicts all the states of the system as it changes over time. Early ecological analyses of the behaviour of moving limbs revealed that these actions could be conceptualised as a system whose states are in constant flux, but in which certain parameters are held relatively constant. This was quite exciting because it represented an extension of the older idea of ecological invariances championed by Gibson. For example, Michael Turvey and Claudia Carello[252] investigated the actions of wielding and probing with a substantial object held in one hand. The critical parameters here relate to the mass and dimensions of the object, and these are established through the ecological activity of active touch, which I introduced when discussing ecological psychology.

Active touch (hefting, grasping, lifting, turning etc) results in an ability to balance the competing inertial forces that attend coupled oscillation, and of course this outcome is peculiar to the specific dimensions of the object, the hand, lower arm, and upper arm dimensions and strengths, and the activity being performed. In contrast to a traditional explanation which would have the agent generate and test calculations of weight, lengths and angles of rotation, and which would pay little attention to the combined effects of object, limbs and task, here the process is considered as a kind of unity of disparate elements which exhibits relative stability over a circumscribed period. The phrase "balancing the competing inertial forces" is another way of saying that local invariants created by the juxtaposition of object, arm and task are being discriminated and managed.

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[252] Turvey & Carello (1995), "Some dynamical themes in perception and action." In Robert F. Port & Timothy Van Gelder (Eds.) *Mind as motion: Explorations in the dynamics of cognition* (pp. 373-401). (Cambridge, MA; MIT Press/Bradford Books).

A second application of dynamics to cognition takes the "coupling" concept in a different way. One finding from the investigation of movement is that oscillating movements can become linked or coupled together[253], or "entrained", a more generic term which describes the way regular actions can become intertwined and more likely to co-occur (a classic, and perhaps apocryphal, example is the way mechanical clocks in the same vicinity tend to synchronise their chiming over time; less apocryphal are accounts of menstrual cycles converging). William Calvin investigates brain function, and has invoked the concept of "resonance" to explain how units of cortex recruit ever-widening areas of cortex to clone representations in a Darwinian struggle for representational resources[254]. This vision of patterns of spreading activation waxing and waning, capturing cortex from less active attractors and abandoning it to those more active, is far removed from the highly modular, algorithmic approach of theorists such as David Marr. Calvin's description of the space in which the Darwinian struggle occurs, that it is "like a dynamically changing patchwork quilt of differing hexagonal territories"[255] brings his story close to that of the connectionists, to which I now turn.

Connectionism

Like DST, connectionism claims cognitive credibility in part because of its biological plausibility. More specifically than DST, however, it is the nature of connection between neurons which lends it this credibility, and unlike DST it does not appeal to an explicitly dynamic mode of operation. The early term "parallel distributed processing", and the current synonym "neural networks" both refer to the neurological model which underpins it, and to the fact that it is indeed modelling of brain-like computation which is its major activity. There is a considerable variety of implementations of connectionist models, ranging from very simple to hugely complex, and I do not intend my comments to be applicable without qualification to this entire range. Generally, a neural net consists of a number of featureless units called "nodes" arranged in layers; they are connected to other nodes in their own layer, as well as to nodes in other layers. Nodes have the ability to influence other nodes positively or negatively by enhancing or

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[253] See Turvey & Carello (1995) for more on the "finger-wagging" experiments.
[254] Calvin (1996), *The cerebral code: Thinking a thought in the mosaics of the mind*. (Cambridge, MA: MIT Press, Bradford Books).
[255] Calvin (1996), p.58.

diminishing their probability of responding, to respond to "input" from devices at the periphery of the network, and to influence output devices; and that is all they do. Typically one layer of the network is devoted to representing input from sensing devices, while another layer sends output to devices which perform some action based upon processing the input; a third layer is commonly the limit, and it is sandwiched between input and output and is known as the "hidden" layer[256].

The most complex neural nets instantiate a many-to-many relation between computational and representational items, in that each representation is distributed over a number of nodes and each node contributes to multiple representations. This is in strong contrast with symbol-processing systems which depend on a one-to-one relation between computational resource and representational content. These models have become known as fully- or highly-distributed nets, even though the critical factor is not the distribution of representational resources, but the multiple employment of the computational resources. Multiple employment names the way any given node in the network may be used many times over for different representations. It means that it will often be impossible to precisely characterize the internal states of the network in representational terms as the exact computational state is below the representational level. These models also display the attractive feature of graceful degradation. This means that with the loss (physical or virtual) of computational resources the ability of the net to handle input degrades slowly rather than catastrophically. Moreover, adequately trained neural networks can fill in incomplete information (pattern completion), deal sensibly with inconsistent information (multiple constraint satisfaction) and can even perform when presented with contradictory information (soft constraint satisfaction). With these in-discrete abilities they can overcome the brittleness of discrete symbolic models that depend upon the application of clear rules, as critiqued by Dreyfus.[257]

Highly-distributed nets seem perfectly placed to explain phenomena such as gradual forgetting, and coherent responding to incomplete or ambiguous input. I presented gradual forgetting earlier in this chapter as a challenge to a discrete understanding of mental states. Consider the following illustration of responding to

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[256] See Smolensky (1988), "On the Proper Treatment of Connectionism." *Behavioral and Brain Sciences, 11*, 1-74, and Churchland & Sejnowski (1992) for detailed treatments.
[257] See Chapter Three, Section 3.1, and Dreyfus (1992).

incomplete or ambiguous input. Suppose we have a trained highly-distributed network that outputs a person's name when presented with an encoding of the way the person looks, and outputs their job description when presented with an encoding of their occupational responsibilities. The behaviour of this network can be described by the following generalizations: "If A then C" and "If B then D". Suppose now that this net is presented with incomplete encodings of a person's appearance and job description simultaneously. What output will be produced? The answer to this question cannot be given if our knowledge is restricted to the above representation-level generalizations. A description framed at the representational level will require the use of phrases such as "sort-of" represents R: for example, the net is "sort-of" representing both the person's occupational duties *and* how she looks.

The example suggests that if both incomplete inputs are simultaneously activated the net may produce an oscillation between outputs, or some form of combination of outputs. In either case, these results could be described as "in-between" representations; that is, as neither one discrete representation nor the other. The combined output will be excluded from discussion because of the ease with which it can be characterized as itself just a discrete representation, albeit a novel one and almost certainly not reproducible in exactly the same form every time the same mixed input is given. This leaves oscillation as an example of in-discrete representation. This behaviour is primarily a consequence of the in-discrete nature of the net itself, where in-discrete here names the ability of the net to represent unities which have no necessary boundary; for example, repeated presentations of a part-lit face may result in multiple different combinations of nodes being activated. Conceptually this notion of in-discreteness is a variant of the overlapping strands form of in-discreteness introduced above.

What is at issue here is the absence of a necessary condition for the representation of a unity; for the representation to be of that particular face there is no rule that must be met, no boundary condition to exceed, only the requirement that a response be output. Put another way, this is to acknowledge that the requirement to produce output takes precedence over the mere disinterested re-presentation of the face, and where non-output is not just another option with weight equal to that of each possible output. Of course, this necessarily implicates the input being received at any particular time, and by extension the environment itself, in both the output being produced and the content of the hidden-layer units. Indeed, content is only legitimately

attributable to the hidden-layer units of high-distributed nets in response to input being received.

Armed with these thoughts, it is clear that incompleteness of input is already a strongly in-discrete characteristic of highly-distributed nets. Evidence of oscillation of output, while distinctive and noteworthy, merely adds to the in-discreteness. Two sub-optimal presentations requiring different responses clearly bring the ability of the net to produce a unified response into question and it can respond in potentially three ways: No response (but the chance of this is minimized by graceful degradation); one new unity (perhaps the most likely response according to the symbol-processing view of representation, but I offer no argument for that here); and oscillation between unities. The point of transition between outputs is the locus of the between-ness in question, and the state of the output component at that time is clearly of interest; but to think of the situation in this way may be to already buy too much discreteness, in the form of acceptance of a determinate point and clearly definable states. The problem being considered here is not just the arcane output of a highly-distributed neural net as model, but rather that this model highlights the more general problem of the transition between differing representational contents which are at the same time also representational states, and the kind of in-discreteness they evidence.

There is much more that could be said about in-discrete cognition. Much of it may already be contained in the writings of the pragmatists, particularly amongst William James' curiously intense descriptions of mental life, which had such an impact on both Bergson and Whitehead. In these he struggles to reconcile phenomenological intuitions of continuity and discreteness in ways which have provided ammunition for both sides of the debate about the "true" nature of reality. He says, immediately after proposing that consciousness in itself can be thought of as a stream, that:

> But now there appears, even within the limits of the same self, and between thoughts all of which alike have this same sense of belonging together, a kind of jointing and separateness among the parts, of which this statement seems to take no account. I refer to the breaks that are produced by sudden contrasts in the quality of the successive segments of

> the stream of thought … Does not a loud explosion rend the consciousness upon which it abruptly breaks, in twain?[258]

There are two reasons for this apparent contradiction, he says. One results from a confusion between the thoughts themselves, and the objects they are thoughts of:

> The things are discrete and discontinuous; they do pass before us in a train or chain, making often explosive appearances and rending each other in twain. But their comings and goings and contrasts no more break the flow of the thought that thinks them than they break the time and space in which they lie … The transition between the thought of one object and the thought of another is no more a break in the thought than a joint in a bamboo is a break in the wood.[259]

The second error, he says, is the overlooking of the large amount of commonality and affinity between the apparently discontinuous thoughts, for example "Into the awareness of the thunder itself the awareness of the previous silence creeps and continues…" This leads him to a marvellously in-discrete image of the stream of consciousness, that "Like a bird's life, it seems to be made of an alternation of flights and perches."[260] The perches, or substantive parts of thought, consist of sensory experiences and their associated thoughts, while the flights, so often ignored due to the "headlong" rush of thought, consist of the relations between the thoughts contemplated while "perching", and are therefore called the transitive parts of thought. These relations are always accompanied by feelings, or an "inward colouring". The brain, being a dynamic environment of various excited and fading states, allows for an intermingling of the lingering consciousnesses due to substantive thought with the swift consciousnesses due to transitive thought, such that "all these consciousnesses melt into each other like dissolving views. Properly they are but one protracted consciousness, one unbroken stream."[261]

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[258] James (1890), *The principles of psychology,* (Chicago: Encyclopedia Britannica Great Books of the Western World Vol.53). p.155.
[259] James (1890), p.156.
[260] James (1890), p.158.
[261] James (1890), p.161.

Here are all the facets of the discreteness versus continuity debate laid out in a vision of in-discrete cognition. There are no borders between thoughts, no essential barriers to thoughts and emotions mingling, dynamic variations in speed and intensity, some ambiguity about how discrete or continuous the world is, and some puzzling about how much of all this is properly due to consciousness itself and how much is due to the way the world is. All of these elements are central features in disputes over the proper interpretation of the most explicit of in-discrete metaphysics, the process philosophy of Alfred North Whitehead. It is to the relation between his work and in-discreteness that I now turn.

Chapter Five – Process and Connection

The in-discrete metaphysics proposed to this point has the following, as yet relatively unconnected, features – it opposes the necessity of boundaries around or between things; it questions the apparent givenness of discrete objects; it questions the obviousness of truths based on elevating just one of a bipolar pair of opposites; it suggests that compositional unity can result from multiple strands which extend beyond the conventional limits of objects and events; it suggests that temporal unity can result from the extension of objects and events known as duration; it downplays the role of human cognition in the constitution of reality (including a preference for "indeterminacy" over "vagueness"); and finally it emphasises the dynamic over the static and the relatively stable over the fully permanent. So why isn't what I am proposing simply a restatement of the process philosophy of Alfred North Whitehead?

There are a number of reasons to reconsider "process" in light of my attempts in this work to elucidate an in-discrete metaphysics, which I will briefly address. The import of these points is that I do not wish the present work to be regarded simply as an explication of existing theories of process. I will not be explicitly addressing these points in order, though I will refer to them throughout this chapter:

1. *Historical location*. Whitehead's process philosophy, elaborated most fully in "Process and Reality" (1929), is a product of an unusual conjunction of interests and metaphysical commitments which are not necessarily salient now.
2. *Interpretive ambiguity*. Scholarly arguments have raged concerning the way Whitehead conceived of continuity versus discreteness, and as my discussion of duration has already revealed there is serious potential for misunderstanding this important issue.
3. *Expanded role of subjectivity*. A novel and attractive feature of Whitehead's process is the reconciliation between objectivity and subjectivity it offers. However the resulting panpsychism is not a feature I wish to highlight as an outcome of in-discreteness.
4. *Problematic role for Platonic objects*. Whitehead's heavily-qualified "God" and "eternal objects" play a major part in his system as the markers of the most permanent, most general features of reality. My interest in taking fuller advantage of relative rather than absolute stability means that these categories must be

downplayed.

5.1 Process

Process philosophy is unquestionably a philosophy committed to connection. But as explicated by Whitehead, and mulled over by his followers and critics, it contains some infuriating inconsistencies. It is not my intention to subject these inconsistencies to detailed scholarly criticism so as to achieve a smoothing of the troubled waters, nor is it my intention to propose a "super-duper-process" which will submerge the inconsistencies in a startling new conception of reality. Rather my aim is limited – I wish to compare process philosophy at certain points with my own account of in-discreteness, in the hope of arriving at a pared-down conception of process which avoids some of the obvious problems while illuminating both process in general and its in-discrete metaphysic in particular. In so doing I hope I will in fact provide some pointers to a better understanding of process, though that will be something of a by-product of my central aim.

What is process? Spinoza had the right idea, says Whitehead, by giving prominence to the systematic coherence conferred by substance, which I dubbed a proto-process view. A significant difference between the two, however, is that Spinoza's "morphological" description is replaced in Whitehead by the description of dynamic process – the preferred model for reality is not the thing but the event, and as I indicated in the previous chapter, events tend to have no determinate beginning nor end. Nicholas Rescher points out that the term "process" should be construed in the usual way, "as a sequentially structured sequence of successive stages or phases." Accordingly it has three features: (1) It is a complex or unity of distinct phases; (2) It has a certain temporal coherence and unity; and (3) It has a structure, or generic format.[262] Whitehead says "The coherence, which [my] system seeks to preserve, is the discovery that the process, or concrescence, of any one actual entity involves the other actual entities among its components. In this way the obvious solidarity of the world receives its explanation."[263] Process is the core notion in a larger picture which Whitehead calls "the philosophy of

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[262] Rescher (2002), "Process philosophy", *The Stanford Encyclopedia of Philosophy (Summer 2002 Edition)*, p.1.
[263] *Process and reality*, p.7.

organism", a term which captures the interconnection at the heart of the theory. The world as we *experience* it is made up of determinate actual entities and actual occasions, and process is their becoming actual, or their "becoming" or "happening" for short. The fundamental philosophical attractor, if you like, is not the fact of their existence as single or multiple substances, but the process by which they become what they are as diverse beings.

It is essential to this picture that everything can be in turn the material out of which the becomings of other things are fashioned, and this creative element is a crucial aspect of process. Creativity is consistent with the "promise" or optimism towards the future to be found in pragmatism, but in Whitehead it becomes the ultimate or topmost category, expressed only through its accidental embodiments and apart from these having no actuality. In this it is unlike a monistic metaphysics such as Spinoza's which grants the ultimate a final or "eminent" reality, and often gives it the name of "God". Actual entities and occasions are the "facts", the most real things, and in the philosophy of organism they are its "creatures". But creativity also has its more usual meaning of "novelty", since an actual occasion is a novel entity different from every other, and what constitutes its novelty is the combined influence of every other entity.

Hence creativity "is that ultimate principle by which the many, which are the universe disjunctively, become the one actual occasion, which is the universe conjunctively … The many become one, and are increased by one."[264] Here is one sense in which continuity asserts itself through process, in the nested flow of history where the new creature succeeds its predecessors by some infinitesimally small increment which nevertheless embodies all its predecessors. The catch is that the new creature is not necessarily an individual particular, and its becoming does not culminate with its birth, in any conventional biological sense of "birth". A clue to this lies in the equation or equivocation between the terms "actual entity" and "actual occasion"; as an *occasion*, the new creature is an infinitesimal extension of itself, and in this sense it is not independent of its predecessors.

In favouring process over fact a subtle break with past dualisms is achieved, and this is probably the most creative element of Whitehead's theory. Spinoza's substance monism, undifferentiated as it is, allows Aristotle's subject-predicate logic to

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[264] *Process and reality*, p.21.

continue flourishing because its focus is on *stuff*, on determinate things in their thingliness, and this logic enshrines a physical-mental dualism by conferring physical status on the object, and mental status on the thought of the object – this is what Whitehead terms "the subjectivist principle". The "concrescence", or becoming, of actual entities allows Whitehead to combine their incompleteness with a refiguring of the notion of dualism[265]. Each of them is built out of two components, in a process that echoes the Hegelian dialectic, but with this crucial difference - the components are radically different, being physical and mental, and the resulting reality is a unique and irreducible amalgam of the two. The successor phase **b** requires its predecessor **a** as its causal antecedent, and **a** requires **b** as its teleological attractor. The terms "physical" and "mental" are heavily qualified, but they cannot be taken to be substances as they are not self-sufficient. To reiterate, the focus of explanation is on the boundless pluralism of experienced reality, and not the singularity or otherwise of its components.

The process refiguring of traditional dualism is most apparent in a transformed understanding of the nature of experience. Descartes' conclusion, that objects of experience have some peculiar definiteness about them in a way unique to experience, is taken seriously by Whitehead. But the conclusion of almost everyone, that experience belongs exclusively to the mental realm, is denied by him. Allied to this is the holist assertion that "...everything is positively somewhere in actuality, and in potency everywhere."[266] The implication of this is that, like Spinoza's conclusion that the reality of something depends on the amount of influence it receives from other things, for Whitehead the actuality of entities is a function of their "feeling" for other entities. It is as if you traverse the causal web and in getting closer to and eventually being absorbed by another entity you progressively lose "your" objectivity even as you contribute to "its" objectivity, and contribute your own subjectivity to its growing subjectivity, Alternatively, you could see yourself as contributing potential to its growing actuality. One manifestation of the growing concreteness of the entity is its growing subjectivity, its ability in turn to attract or be attractive to other entities. This is

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[265] Summary details of concrescence in this paragraph and the next are based on Vlastos (1963), "Organic categories in Whitehead." In George L. Kline (Ed.) *Alfred North Whitehead: Essays on his philosophy*. (pp. 158-67) (Englewood Cliffs, NJ: Prentice-Hall).

[266] *Process and reality*, p.40.

a fuller explanation of the relationship between the **a** and **b** components mentioned above.

It will probably come as no surprise that all the difficult elements of process are related, since coherence is touted as one of the cardinal virtues of Whitehead's system. The first troublesome aspect is the emphasis on experience, bearing in mind that "experience" here is not confined to mentality. Whitehead strongly adopts what he calls the "reformed" subjectivist principle, which is "that the whole universe consists of elements disclosed in the analysis of the experience of subjects. Process is the becoming of experience … apart from the experience of subjects there is nothing, nothing, nothing, bare nothingness."[267] One of the very first things I did in Chapter One was to consider the nature of experience of objects, with a progression from the ecological experience of objects and affordances to the highly abstracted nature of philosophical reflection. Whitehead's own highly-abstract "categoreal scheme" treads an epistemic tightrope between, on the one hand, the simple-mindedly abstract, evident in the "fallacy of misplaced concreteness" of which he accuses other philosophers, and an overriding respect for the reality of the things encountered in experience, which he terms the "ontological principle", on the other. This principle is an amalgam of the concreteness to be found in unreflective perception with a methodological rationalism "broadened and extended" from Locke, who asserted that "power…is a great part of our complex ideas of substances."

Whitehead transforms "substance" into his own "actual entity" while "power" becomes the principle that the reasons for things are to be found in their composite nature; "in the nature of God for reasons of the highest absoluteness, and in the nature of definite temporal actual entities for reasons which refer to a particular environment." Hence everything has a reason for its existence – he summarises the ontological principle as "No actual entity, then no reason."[268] In effect, efficient and final causation are combined into a notion of basic experience, that everything actual is an experience for itself[269]. This is the cornerstone principle of panpsychism, that all actual things are subjects. John Dewey elaborates on some related metaphysical implications when he points out that the rejection of materialism is also the rejection of

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[267] *Process and reality*, pp.166, 167.
[268] *Process and reality*, pp.18-9.
[269] McHenry (1992), p.22.

"the doctrine that matter is the efficient cause of life and mind, and that 'cause' occupies a position superior in reality to that of 'effect' … 'Effects', since they mark the release of potentialities, are more adequate indications of the nature of nature than are just 'causes'"[270]. The difficulty with the nature of experience, then, is not due to any apparent inconsistency but rather is a matter of understanding how this sort of reason" can be as concrete as the experience of which it is a part: but to the extent that it is, the bundling of the subjective and the objective together under the head of "experience" represents the influence on Whitehead of Leibniz, the British empiricists (particularly Locke and Hume), and of Kant.

The second troublesome aspect of process is closely related, and involves a very strong distinction between potentiality and actuality. It will already be apparent that experience is of actually existing things, though the idea of "thing" may not yet be clear. It is also essential, and this is the sticking point for many commentators, that every actual entity is independent and complete**.** There seems to be a puzzling disjunction in Whitehead's process between the becoming of an actual entity, with all the solidarity and holism attendant on the becoming, and the actuality of that entity in its completeness and isolation, and this has bothered many. This distinction is especially puzzling given that the concrescence of a new actual entity usually results not in an entirely new creature but in what could be regarded as a new phase of an existing object. Whitehead is quite emphatic about the atomicity of the new creature when he says "The ancient doctrine that 'no one crosses the same river twice' is extended. No thinker thinks twice; and, to put the matter more generally, no subject experiences twice."[271] Most commentators have opted to analyse alternative views of time in order to attempt a reconciliation[272].

A third troublesome aspect of process, and again one which is closely related to the previous points, is Whitehead's preferred mechanism for providing the stability of form and structure to be found in experience – these are the seemingly Platonic "eternal objects", and beyond them, God. Platonic philosophy rightly appeals, he says, because it

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[270] Dewey (1929), pp.214-5.
[271] *Process and reality*, p.29.
[272] See Sandra Rosenthal (2000), *Time, continuity, and indeterminacy: A pragmatic engagement with contemporary perspectives* (New York: SUNY)*;* Chris van Haeften (2001), "Extension and epoch: Continuity and discontinuity in the philosophy of A. N. Whitehead." *Transactions of the Charles S. Peirce Society, 37(1),* 59-79; James Felt (2002), "Epochal time and the continuity of experience." *The Review of*

gets the primary philosophical question the right way around – philosophy's business is to explain the emergence of the more abstract things from the more particular things, not to ask how concrete particulars can be built up out of universals. In other words, philosophy should seek the form in the facts: "Each fact is more than its forms, and each form 'participates' throughout the world of facts."[273] This commitment supplies one clue to explain the distinction between possibility and actuality, since actuality provides a terminus or limit which marks the completion of the entity and distinguishes it from an incomplete one. However it is a commitment which brings the "reformed" subjectivist principle and the ontological principle into conflict – the former says quite firmly that apart from experience there is "nothing, nothing, nothing, bare nothingness", while the latter suggests that only actual occasions are real; hence eternal objects, which are explicitly "pure potential"[274], seem to lack the necessary reality[275].

In the following sections I will look more closely at the contentious aspects of process, as these disclose some critical theoretical impasses which an in-discrete analysis may clarify. I will consider the first two, the nature of experience and the actuality/possibility distinction together. It has been relatively easy on the present exposition of process to discern a nested continuity operating in becoming, though this was noted only in passing and may yet prove to be illusory. I will need to consider the internal workings of process more closely in order to determine whether process does in fact rely on something akin to overlapping in-discreteness.

5.2 Discreteness in experience vs continuity in possibility

It might be thought that an overarching commitment to connection will result in some conflict between the way experience of the world seems to us and the way the world might actually be. It would be easy to simply conclude that "seeming" necessarily falls short of conveying the nature of reality, though I am attempting to avoid this in the present work. Starting with an overarching commitment to the actuality of experience does not guarantee that this problem is avoided, however, since Whitehead and the

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Metaphysics, 56 (1), 19-36 (pdf pagination differs; Pp.1-12).

[273] *Process and reality*, p.20.

[274] *Process and reality*, p.23.

[275] A point made in the very first published analysis of *Process and Reality*, by Everett W. Hall in 1930 (see Hall, 1963, "Of what use are Whitehead's eternal objects?" In Kline, pp. 102-16.

pragmatists came to quite different conclusions about the appearance-reality relationship. Whitehead expresses this conflict frequently, and it is his attempts to be precise about the relation between apparent atomicity and a less apparent continuity which have disconcerted his commentators. One such attempt runs as follows:

> Thus the ultimate metaphysical truth is atomism. The creatures are atomic. In the present cosmic era there is a creation of continuity. Perhaps such creation is an ultimate metaphysical truth holding of all cosmic epochs, but this does not seem to be a necessary condition…But atomism does not exclude complexity and universal relativity. Each atom is a system of all things.[276]

A central objective of this chapter will be to make the apparent conflict between Whitehead's commitment to both atomism and continuity less metaphysically intractable. It will become apparent that he was well aware of in-discrete approximations to continuity, as were many of his predecessors.

In the years before Whitehead's gradual adoption of the philosophy of organism, pragmatists such as Peirce, James and Dewey struggled with this problem. What they all wished to avoid, at one extreme, was a metaphysics which granted quite different criteria of reality to experience and nature. At the other extreme lay the apparently eccentric metaphysics of Bergson, which had no particular problem with all things being, in some degree, durational. The problem has been interpreted by most commentators as a dispute about the nature of time, but as Whitehead adopts Locke's view that the passage of time is "perpetual perishing"[277] it seems that the experience of time as traditionally understood is merely a by-product of process. In what follows I will not directly address the issue of the nature of time as I do not wish to take a stand, my interest being in the way discreteness and continuity are reconciled.

Zeno's paradox of the arrow in flight is often dismissed as having no substantive mathematical or physical implications. Whitehead took it seriously, though he generalised the argument from motion to becoming. The paradox is interpreted by most commentators (Aristotle being a notable exception) as showing that motion is

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[276] *Process and reality*, pp.35-6. van Haeften (2001, n.31) draws attention to Whitehead's apparent uneasiness about this conclusion, as he underlined the first "not" and added a question mark in his personal copy. He also annotated his copy to refer back to this passage – I will have more to say about this later.

impossible because it cannot begin[278]. Before the arrow can cover half the distance it must cover one-quarter, before it can traverse this distance it must travel one-eighth … before it can traverse an infinitely small distance it must travel half that … hence motion cannot commence. It is in his analysis of this problem that the difference between Whitehead and Bergson becomes apparent[279]. Whitehead's reading is that a genuinely contradictory conclusion is reached – either in a process of becoming, nothing (that is, something without temporal extension) becomes; or becoming is not always divisible into parts that are themselves divisible becomings. Bergson dropped the first assumption in favour of the view that becoming is everything; that nothing ever really *is*. This would mean that the world does not consist of real individuals with a distinct identity, a conclusion that Whitehead found unacceptable as it implies a world immune from rational analysis. Instead Whitehead gave up the second assumption, to conclude that Zeno was groping for an argument which distinguishes between the necessity for every act of becoming to have a *successor*, which is clearly implied by something already existing, and every such act of becoming having a *predecessor*, which cannot be established without an additional premise. Whitehead was happy to supply this premise, by concluding that every act of becoming results in a "creature" with temporal extension, but the act itself is divisible into acts without temporal extension.[280]

It is at this point that Whitehead offers William James as an authority, citing a passage which can be seen as a development of the earlier "flight of a bird" image of the stream of consciousness. My interpretation conflicts with that of those who see James' analysis of experience as significantly contributing to Whitehead's problematic disjunction between continuous possibility and discrete actuality, or as it is also known, epochal becoming[281]. James says "Either your experience is of no content, of no change, or it is of a perceptible amount of content or change. Your acquaintance with reality

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[277] *Process and reality*, p.147.
[278] In *Physics*, Book 6, Ch 9, 239b, Aristotle dismisses this "paradox" as being essentially the same as Achilles racing the tortoise, which is generally interpreted as showing that the race will never *end*.
[279] Chappell (1963), "Whitehead's theory of becoming", in Kline, p.73.
[280] *Process and reality*, p.69.
[281] Rosenthal refers to the problematic use made of James by "Whiteheadian scholars" (2000, p.123) then proceeds to give her own more continuity-friendly interpretation of James; John Buchanan (2000, "A process, pluralistic universe." *Concrescence: The Australasian Journal of Process Thought, 1*, 1-12) takes all of James on drops or buds of experience as consistent and relatively unproblematic: Felt (2002) refers to Whitehead making "much – arguably too much" use of James' analysis, while van Haeften (2001) does not refer to James at all.

grows literally by buds or drops of perception. Intellectually and upon reflection you can divide these into components, but as immediately given, they come totally or not at all."[282] To some extent James is simply repeating Peirce's understanding of durational cognition as illustrated using the inverted triangle dipped in water – recall that Peirce points out that, *given* that a cognition exists, there can be no shortest duration; that is, there either is cognition or there is not. However in a later work, not quoted by Whitehead, James is clearly distancing himself from a discrete interpretation when he says "The concrete pulses of experience appear pent in by no such definite limits as our conceptual substitutes for them are confined by. They run into one another continuously and seem to interpenetrate"[283] This description contains two obvious pointers to in-discreteness: the lack of "definite limits", and interpenetration. Are there any analogues to these in Whitehead's own descriptions of process? Before I look at this, the case for Whitehead's problematic disjunction needs to be made clearer.

How in-discrete is process?

We have already seen that duration has fundamentally in-discrete characteristics, when conceived rightly as (a) multiple, (b) heterogeneous, and (c) overlapping. This formulation works for Bergson, who is comfortable ascribing the "cuts" in the flow of experience to mental activity of an everyday nature; he is quite clear that apart from these acts the flow of duration is continuous. He says "The apparent discontinuity of the psychical life is then due to our attention being fixed on it by a series of separate acts: actually there is only a gentle slope."[284] Whitehead too has a conception of duration that is not so different in its emphasis on indivisibility; as noted already, the culmination of his analysis of Zeno's arrow paradox is "the conclusion … that in every act of becoming there is the becoming of something with temporal extension, but that the act itself is not extensive…"[285] This conclusion has caused significant problems for commentators

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[282] From James, *Some Problems of Philosophy*, Ch.10. Quoted in *Process and reality*, p.68. My introduction of this quote rather sympathetically links it directly to the idea of duration, but curiously Rosenthal chooses a different quote to illustrate James' influence on Whitehead, one which emphasises the apparent discreteness of the "drops".

[283] From James, *A Pluralistic Universe*, p.127. Quoted in Buchanan (2000), p.2.

[284] From *Creative Evolution*, p.3. Quoted in Felt (2002), p.4.

[285] There is a question about the differing understanding of the *length* of duration, since Bergson accepts that duration is individual and of varying length up to the macro-temporal. Whitehead's durations are infinitesimal, though of varying lengths.

because it results in time having a double aspect – understood from within, from the perspective of the becoming occasion, it will seem continuous, while from without, from the perspective of the world, it will seem atomic.

Sandra Rosenthal, in her reconstruction of Whitehead's theory of time, suggests that his commitment to reconciling experience with the findings of science results in a variety of pressures towards atomicity – from the need to derive the point-like abstractions of space-time from experienced duration; from the need to preserve the arrow of time; and from the need to preserve the absolute fixity of the past[286]. Together these result in the absolute definiteness of perishing actual occasions, and a view of time as constituted by discrete stages, or epochs. The process of concrescence of a new actual entity can be considered in two distinct ways which respect the distinction between possibility and actuality; as Whitehead says: "Genetic division is division of the concrescence; coordinate division is division of the concrete." From within, the process is seen as growth from phase to phase, and it is appropriate to speak of one phase being "later" than another; "this genetic passage from phase to phase is not in physical time … it can be put shortly by saying, that physical time expresses some features of the growth, but *not* the growth of the features." Coordinate analysis, on the other hand, relates to the final complete feeling of the actual entity, or its "satisfaction". "The actual entity is the enjoyment of a certain quantum of physical time", and the quantum in question is an extensive region of space-time[287]. Hence the tensed language suitable to the succession of phases in becoming is troublingly incompatible with Whitehead's frequent assertion that the process is not "in" objective, physical time.

Rosenthal critiques a number of attempts to interpret and reconstruct Whitehead's position, including Jorge Nobo's move from the "extensive continuum" of real possibility to the atomicity of actual occasions; and Donald Sherburne's attempt to argue that actual occasions share an interface, which is a complementary move from discreteness to continuity[288]. Both these and other attempts fail, she says, because they ultimately rely on *contiguity* as the mediator between discreteness and continuity – "From such a welding together of atomic units there can arise only a pseudocontinuity of

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[286] Rosenthal (2000), pp.11-12.
[287] All Whitehead quotes are from *Process and reality*, p.283. Emphasis in the original.
[288] Jorge Nobo, *Whitehead's Metaphysics of Extension and Solidarity* (SUNY, 1986), and Donald Sherburne, "Whitehead without God", in *Process and Christian Thought* (Bobbs-Merrill, 1971). Quoted

contiguous parts."[289] Some other attempts have been made to reconcile discreteness and continuity in process, and at least one of the ones I will consider discovers in-discrete mechanisms in Whitehead's system. Chris van Haeften concludes that both continuity and discontinuity have their place in Whitehead's system, and that time can be considered in both ways, while James Felt pursues a similarly inclusive aim in looking at Whitehead's atomistic conception of a person.

Felt's analysis will not keep us long – he looks at the prospects for human freedom if Whitehead's analysis of the ever-perishing actual entity which is a person is true. How can such a person act intentionally and make morally binding decisions on behalf of later instantiations of themself? Felt's proposed solution appears not to be true to the metaphysics of process as such, but is rather informed by the differing methodologies of Bergson and Whitehead, as these famously result in differing conceptions of continuity. According to Felt, Bergson's method of intuition, his "direct attunement to immediate experience", which eschews spatialising, reveals a continuity that includes its parts within a whole and where the parts differ qualitatively – this is his idea of multiplicity. Conceptual analysis, on the other hand, leads Whitehead to consider the parts of experience as spatialised and homogeneous[290]. Allied to this distinction are two theses about knowledge influenced by phenomenology; that it is relational, or not free of our own requirements for it, and that it is perspectival, or horizon-granting and world-making. On Felt's analysis, not only is Whitehead clearly misguided, and has failed to abide by his own injunctions to avoid the Fallacy of Misplaced Concreteness, but he has also indulged in bad phenomenology.

Van Haeften zeroes in on what he terms the "duality" in the structure of reality; that on the one hand it exhibits the characteristics of process, while on the other hand it exhibits individuality. Individuality is relative, so an enduring individual "consists of the retention of a characteristic pattern with a certain value for itself and for its environment."[291] In effect, the pattern *is* the object, or at least, there is a dominant pattern that keeps its identity throughout the successive time parts, otherwise the individual disintegrates. Thinking about the relative influences on the individual of

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in Rosenthal, (2000), pp.16-19.
[289] Rosenthal (2000), p.23.
[290] Felt (2002), p.7.
[291] van Haeften (2001), p.62, quoting Whitehead's *Science and the Modern World*, pp.94, 104.

external and internal factors leads van Haeften to consider the role that unity "for itself" plays, and he cashes this out in terms of the relational character of the individual's dependence on its environment. Curiously, the ontological principle plays no part in this analysis, and yet it would seem quite deliberately to provide the basis for the character of an "in itself". This character, van Haeften points out, is oriented towards the future: In Whitehead's words, "An event has anticipation"[292]. The endurance of an object therefore consists of the same spatial pattern being passed from epoch to epoch. The "pattern" is not instantaneous, so its initial realisation has duration; in addition, since the pattern's efficacy depends upon it being passed on as a whole, this too cannot be instantaneous – hence Whitehead's dictum that an epoch is not realised *via* its successive parts but is given *with* its parts[293].

Van Haeften carries on looking at process from an object perspective, using the same section of *Process and Reality* quoted from above, and highlights the role that extension plays generally in the causal holism of the world. As Whitehead points out, this causal role has dual aspects:

> This orderly arrangement of a variety of routes of transmission, by which alternative objectifications of an antecedent actuality **A** can be indirectly received into the constitution of a subsequent actuality **B**, is the foundation of the extensive relationship among diverse actual entities. But this scheme of *external* extensive relationships links itself with the schemes of internal division which are *internal* to the several actual entities.[294]

Van Haeften is thereby able to find a resolution to the apparent standoff between continuity and discontinuity, and to make use of the nested continuity I identified above: He claims that the unity of the epoch, from which the discontinuity (the "drops or buds" of experience) flows, lie in its *prospective* direction, while the continuity lies in its *retrospective* direction.

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[292] van Haeften (2001), p.63, quoting *Science and the Modern World*, p.73.

[293] van Haeften (2001), p.67, quoting *Science and the Modern World*, p.125. Emphases from van Haeften. Couple this with a statement expressing "genetic unity", and you have something which looks very like a nested continuity – Whitehead notes that "The atomic actual entities individually express the genetic unity of the universe. The world expands through recurrent unifications of itself, each, by the addition of itself, automatically recreating the multiplicity anew." (*Process and reality*, p.286) Here the continuity lies not immediately in the objects themselves, but in the ongoing context to which they contribute and from which their successive phases emerge, of which more below.

From the retrospective point of view there are no smallest durations, hence there is a continuity, but from the prospective point of view there must be a minimum duration. The realisation of the enduring pattern requires a certain lapse of time[295]. The nested continuity paradigm allows us to restate this, by saying that retrospectively continuity ensues because all prior epochs are incorporated in (ie, have contributed to) the current phase, which as duration is characterised by a certain retrospective completeness coexisting with a certain prospective incompleteness; while prospectively the succeeding phase will represent the completion of the current minimum duration.

While this is a satisfactory resolution as far as it goes, it does not go far enough. The outstanding matter for van Haeften is the unresolved relation between extension and atomicity in the actual occasion, and the extent to which Whitehead's sharp distinction between them might mean that epochs are in fact non-temporal. His resolution of this, presented below, will complete discussion of the nature of continuity in process. There is still an outstanding matter for me, and this relates to the pattern that is passed on from epoch to epoch; it is an apparent requirement that the pattern be complete. Succession is only possible if the epochs are passed on to their successors as wholes[296], which would seem to set a high value on identity, a discrete concept, and to reduce the relevance of duration. I will discuss this further in a later section that focuses on the role of eternal objects.

Van Haeften's issue: Atomicity vs extension in the actual occasion. Although there are apparently contradictory statements in Whitehead's work about the relation between extension and atomicity, such as the one already mentioned about the genetic process not being in physical time (that is, where "physical time expresses some features of the growth, but *not* the growth of the features."[297]), van Haeften is resolute in pursuing the implications of his prospective/retrospective distinction. His final solution lies in returning to the bipolar nature of actual occasions I mentioned when giving an overview of process earlier in this chapter. To repeat, and expand: Each entity is essentially bipolar, having both physical and mental elements; these exemplify the ontological principle of "No actual entity, then no reason." The integration of these

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[294] *Process and reality*, p.286.
[295] van Haeften (2001), pp.68-9.
[296] van Haeften (2001), p.69.
[297] See n.287

elements into a unity of experience is the process of concrescence, and the final unity is termed the satisfaction. The aspect of experience appropriate to each pole is called its "feeling", hence there are physical feelings and conceptual feelings. Now one implication of the ontological principle is that no thing comes from nowhere, or, that everything is referrable to some actual entity; either transmitted from the past or belonging in the future to the *subjective aim* of an entity to whose concrescence it belongs. The subjective aim is an expression of an entity's incompleteness, it is a striving towards order somewhat similar to Aristotle's late use of energeia[298] and it jointly determines the relevance of eternal objects for conceptual feeling, and constitutes the autonomous subject.

From the ontological principle it follows that the mental pole initially merely registers the physical pole; this is its sole "datum of experience", but this registration or conceptual feeling, limited as it is, is valuation, and conceptual valuation introduces creative purpose. Hence the mental pole introduces the subject as a determinant of its own future, its concrescence; and the actual entity both exemplifies and transcends efficient causality. As Whitehead says, "Every actual entity is 'in time' so far as its physical pole is concerned, and is 'out of time' so far as its mental pole is concerned."[299] All of the foregoing is true of both objects and events, but it is more true of objects, since they are relatively more enduring and stable than events and the concept of "pattern" more nearly fits their nature. Van Haeften finds the answer to his problem of reconciling atomicity and extension in the concrescence of an object, which necessarily has an "atomic" objective pattern at which subjective aim can be directed. A becoming aimed at an atomic object in a single act is a duration which is indivisible, but nevertheless it results in an actual entity with extension.[300] The discontinuity inherent in the epochality of the present, he says, is a "mental" discontinuity of the anticipation prompted by the organic order, but in its physical aspect the occasion is continually extensive.[301]

Donald Sherburne portrays the transmission of pattern not just from the anticipatory nature of a forward-looking mental pole, as van Haeften does, but in terms

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[298] See Chapter Two, section 2.3.
[299] *Process and reality*, p.248. Condensed from *Process and reality*, pp.244-8 (Part 3, Ch. 3, "The transmission of feelings").
[300] van Haeften (2001), p.73.

of the *mutuality* of this anticipation seeking a new and incomplete physical pole. His description marries an overlapping strands vision with the already-understood characteristics of duration to result in a fully in-discrete account of the succession of actual entities which is worlds away from the "interface" solution Rosenthal critiques from his earlier writing, mentioned briefly earlier in this chapter. Sherburne says:

> A Whiteheadean actual entity becomes and perishes, but its perishing, its death rattle so to speak, is the donation of just that form of definiteness which it has become as part of the initial datum for … its successor occasion…[A] perishing actual entity is yet a brooding presence which lays its mark on the initial conditions which are received, and then sorted out in terms of their importance and value by the process of becoming which is the reality of the emerging successor occasion … [I]n this moment of transition from past to present, from preceding actual occasion to subsequent actual occasion, the decision, the power, the reality, the spontaneity of response is all located in the present; it is located in the concrescing, becoming occasion that is organizing its own affirmation, denial, or creative transformation of its inherited initial conditions.[302]

For Sherburne there does not seem to be a problematic discreteness or atomicity about process considered in this way. His gloss on the initial stage of concrescence agrees with the thrust of van Haeften's analysis, and it agrees with one of Whitehead's attempts to resolve his own dilemma. In his personal copy of *Process and Reality,* Whitehead refers back to a passage I quoted earlier, in which he wonders if the creation of continuity might be only a contingent feature of the present cosmic epoch. His concerns relate to a passage that provides a negative answer of sorts to his own challenge – a passage in which he describes the transition from a perishing actual entity to its successor in terms which could have inspired Sherburne's words above. Whitehead writes that: "…the first stage of the process of feeling is the reception into the *responsive conformity of feeling* whereby the datum, which is mere potentiality, becomes the

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[301] van Haeften (2001), p.75.
[302] Sherburne (1994), "Some reflections on Sartre's nothingness and Whitehead's perishing.", *Review of Metaphysics, 48*, 3-17, p.10.

individualized basis for a complex unity of realization."[303] This mechanism of transition is therefore a systematic means for the production of continuity by in-discretely uniting the perishing of one actual entity with the creation of the "complex unity" that is its successor, and the implication is that its absence would indeed be arbitrary and contingent, but its presence seems necessitated by its role in the system.

What is Rosenthal's solution to the problem at issue here? She thinks that pragmatism can offer a more fully-developed picture of how orientation towards the future functions to deliver the continuity apparent in experience. These words of John Dewey's may be the kind of vision she has in mind; he says:

> "The union of past and future with the present manifest in every awareness of meanings is a mystery only when consciousness is gratuitously divided from nature, and when nature is denied temporal and historical quality. When consciousness is connected with nature, the mystery becomes a luminous revelation of the operative interpenetration in nature of the efficient and the fulfilling."[304]

Now the interesting thing about these words is that, were a more technical definition of "consciousness" and "nature" to be employed, they could be Whitehead's manifesto for the philosophy of organism built around the ontological principle. The pragmatist concern with demystifying the everyday, however, means that this is not an option. The use of an everyday meaning for consciousness nevertheless highlights a problem for Rosenthal, showing the need for her to steer a course carefully between two unacceptable alternatives: on the one hand, she says, pragmatism takes seriously the interrelation between temporal descriptions of human experience and the more speculative metaphysical claims about cosmic time; but on the other hand, tendencies towards collapsing the two matters into one is a large part of the criticism of pragmatism, that it is idealistic and anthropomorphic and opposed to speculative metaphysics. Consequently, she reluctantly and with reservations separates the metaphysical and interpretative routes to understanding temporality[305].

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[303] *Process and reality*, p.113. Emphasis from Whitehead's underlining in his own copy. See the Editor's Notes, *Process and reality*, p.400.
[304] Dewey (1929), p.286.
[305] Rosenthal (2000), pp.119-20.

Rosenthal's preferred model of temporality is Peirce's conception of duration, which I detailed earlier. In summary, his analysis shows that time has a thickness and directional movement due to overlapping strands of duration. In the somewhat forced distinction Rosenthal has accepted, this analysis comes down on the side of temporality as interpretive, rather than cosmic, activity thanks to the mediate perceptions which are said to connect each strand or moment, and which seem to involve a degree of interpretation. Here "interpretation" should be understood as something akin to "computation", as a cognitively impenetrable, non-intentional mechanism. In particular, such a mechanism is required in order to "fix" the indeterminacy which is constitutive of reality; "an indeterminacy born of an indefinite richness that the human mind must make intelligible through the interpretations that render indeterminate situations more precise."[306]

Two aspects of Peirce's approach to duration appeal to Rosenthal: it explains the production of temporal continuity, which in my opinion is also adequately dealt with by Whitehead's philosophy of organism, and it has a view of a thick present in which aspects of both the past and the future are constitutive. She concludes that with these tools only pragmatism has the resources to adequately understand our experience of time. I have confined my attention to the first issue as it most directly addresses my main concern, which is the proper understanding of continuity. The second is obviously related, as my discussion of duration showed – clearly a thick present as minimally understood is an in-discrete entity and will contain elements of both or either the past and the future. It becomes a matter of doctrinal dispute as to the relative contribution of each. But as for duration, and the future? I think process and pragmatism have similarly in-discrete claims on an indeterminate, productive and creative future, and that Rosenthal is on much weaker ground with her claims for the unique continuity of pragmatism. It is to the future, and they way in which pure possibility contributes to future actuality, that I now turn. My interest, as before, is less on the doctrinal issues than on the implications for continuity, and the potential for an in-discrete understanding to illuminate the issues.

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[306] Rosenthal (2000), p.143.

5.3 The role of God and eternal objects

Up to this point it has been possible to discuss process purely on its own terms, as the mechanism of concrescence of actual entities/occasions – in short, the discussion has been pursued with an emphasis on the *becoming* of creatures, rather than on the becoming of *creatures*. When we turn attention to what becomes, however, the apparent naturalism of process seems to separate out into a tripartite hierarchy with strong Platonic elements. Whitehead's cosmology can be briefly summarised to put this in context: space is a medium that can sustain order; time is succession of order. These are, in a sense, the metaphysical essentials. They allow something to be, and they permit it to change, but there is no brake on the change unleashed. Something that channels the essential productivity into enduring and ever-intensifying beings is necessary, otherwise there is nothing but pure difference. The intensity of these enduring concentrations is of vital concern, but of concern or relevance to who or to what? *Eternal objects* are the channels that concentrate differences and direct possibilities towards determinate actual entities. And why is there any productivity at all, why something rather than nothing? The actual entity that exemplifies ends and beginnings is *God*, while the driver that connects the beginning to the end, via process, is the intensification of feeling.

God

Whitehead thinks that the production of difference in itself is not an expression of creativity, and cannot alone sustain the relative endurance of experienced things. He says "Apart from the intervention of God, there could be nothing new in the world, and no order in the world. The course of creation would be a dead level of ineffectiveness, with all balance and intensity progressively excluded by the cross currents of incompatibility."[307] Instead of invoking a Darwinian mechanism of natural selection to account for the success of some of the diversity of creatures over others, he combines the internal direction of process, its subjective aim, with the pragmatic value of its specific satisfaction upon completion , which is its "superjective" character[308]. While the stability of this character is due to the ingression of eternal objects into the concrescence,

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[307] *Process and reality*, p.247.
[308] *Process and reality*, p.87.

God's role is to embody the ultimate principle, which is creativity. This he does by expressing the double nature he shares with all creatures, being both a product of creativity and a condition for it. Thus Whitehead's God is not thingly, not substance, and not a vision of the totality – as he says, it has no final, "eminent" reality[309]. But it does have something in common with Plato's and Christianity's ultimate being, as it exemplifies the highest and most intense "emotion" – but not quite The Good, and not quite The God of Love. God is a creature always in concrescence, always reaching out to the world. This reaching-out is called "appetition", after Leibniz, and is the conceptual valuation of an immediate physical feeling combined with the urge towards realisation of that fact as conceptually prehended. This is an appetite towards *relevant* difference, towards novelty[310].

God's aim for any particular occasion is depth of satisfaction as an intermediate step towards fulfilment of his own being, therefore God's purpose in the creative advance is the evocation of intensities[311]. Here, intensity can be seen as related to complexity in the form of a collection of entities, called a nexus, which collectively exhibit what Whitehead calls "vagueness". Vagueness results from the differences between the related entities becoming irrelevant as they contribute to the satisfaction of the whole, with accompanying indefinite possibilities for division of that whole; this is complemented by a growing intensity as common characteristics become more and more relevant for the future subjective aim of the nexus[312]. In the final analysis, God is a device for securing the breadth of phenomena which manifest in experience, as the dual nature of all things is expressed on the grandest scale. Whitehead says

> God and the World stand over against each other, expressing the final metaphysical truth that appetitive vision and physical enjoyment have equal claim to priority in creation. But no two actualities can be torn apart: each is all in all. Thus each temporal occasion embodies God, and is embodied in God. In God's nature, permanence is primordial and flux is

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[309] *Process and reality*, p.7. In this it differs markedly from Bradley's absolute idealism, which it resembles in many other respects. Bradley's aversion to relations led him to an ultimate reality consisting of a nonrelational One. Whitehead's concept of experience, on the other hand, takes relations as essential elements in a plurality of individuals. See McHenry (1992).
[310] *Process and reality*, p.32.
[311] *Process and reality*, p.105.
[312] *Process and reality*, pp.111-2.

> derivative from the World: in the World's nature, flux is primordial and permanence is derivative from God.[313]

Inasmuch as God exemplifies unity in diversity he embodies overlapping strands in-discrete principles. He is continuous with the world to the extent that his nature conditions it, interpenetrates with it, and is constituted by it. The creative advance of the world is a phenomenon of nested in-discreteness, proceeding continuously by infinitesimal extensions of duration, and as this advance develops, so too does God. But how necessary is God to this system? It is easy to be overwhelmed by the complexity of Whitehead's categoreal scheme and his tightly-interwoven explanations of the scheme's components. Trying to be true to every possible experience tends to result in an architecture of baroque complexity with a heavy emphasis on reconciling apparent opposites, as Kant demonstrated, and what better way to do this than to have an ultimate entity at the centre of the system? Donald Sherburne proposes an alternative, a process without God, or what he calls a "decentered Whitehead".

In Sherburne's vision of process there is a vast plurality of entities each of which is a centre of value, meaning, and order.[314] Rather than mounting a rationalist challenge in terms of the coherence of the concept of God within Whitehead's system, Sherburne looks for reasons to prefer a decentered process that rests on an empirical examination of experience and the world. It seems, however, that his protagonist is not so much Whitehead himself, but rather those theologically-inclined Whiteheadians who postulate an interventionist, best-of-all-possible-worlds God, one which is not so apparent in the description of his role I have given so far.

Sherburne elaborates a scenario that involves a piano falling from the Empire State Building, which may or may not kill a woman wandering below. The theological position would have God influencing the world to maximise positive future experience. Could he influence the piano directly, to divert it from its course? No chance, says Sherburne; the capacity of the piano to have a novel adjustment of feeling is virtually nil, as it is much too primitive a creature. This conclusion is supported by Whitehead's distinction between organic and inorganic entities. In the latter, "what is lost is originativeness, and any evidence of immediate absorption in the present… [I]norganic

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[313] *Process and reality*, p.348.

entities are vehicles for receiving, for storing in a napkin, and for restoring without loss or gain."[315] At the other end of the piano's descent, and the other end of the complexity spectrum, are those actual occasions that constitute moments in the nexus which is a person. Human beings have freedom to make choices, so could God intervene by somehow warning the people below? Sherburne wants to force the God-centred Whiteheadian into an unacceptable position of agreeing that the only way God can influence the threatened woman is by making her aware of things in her immediate past of which she is not aware from any other source (ie, *as if* she had glanced up, or someone had shouted a warning). God's purpose in doing this would be to enhance his own future experience. Sherburne claims, sensibly, that this is not in fact how the world works – it is not nearly as harmonious and orderly, and is far more absurd, than this. Further, to claim that God offers this information but human freedom results in the frequent and wilful ignoring of it, is existentially implausible. There are just too many instances of outright "bad luck".

Sherburne's alternative is indeed a decentred Whitehead, and a world where "larger and larger patterns of meaning and order emerge gradually, fitfully, and unevenly from the churning multiplicity of value centers…"[316] In this world order is emergent, from the bottom up, not imposed from the top down. Everything needed to understand this emergence is to be found in the character of concrescence, the core of process, which I discussed in the previous section. Here, he says, is all the thrust towards order, harmony and intensity of experience supplied by God, but to be found in the very nature of the world[317]. Dispensing with God seems quite straightforward on Sherburne's more naturalistic account, but it leaves eternal objects dangling unconnected to actuality. What becomes of them in a categoreal scheme without its ultimate category?

Eternal objects

God plays a critical role in the origins of things. His "primordial nature" consists in the unconditioned conceptual valuation of the entire multiplicity of eternal objects, which he

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[314] Sherburne (1986), "Decentering Whitehead.", *Process Studies, 15 (2)*, 83-94, p.83.
[315] *Process and reality*, p.177.
[316] Sherburne (1986), p.92.
[317] Interestingly, Murray Code (2002, "On Whitehead's almost comprehensive naturalism.", *Process Studies, 31(1)*, 3-31) defends Whitehead's "naturalism" without once mentioning the role of God.

directs towards ongoing becomings depending on their "relevance" for those becomings. This means that they function in the realm of possibility or potentiality only, since the object is fully actual only when becoming is complete. Two forms of potentiality must be distinguished; one of which refers to the potential for ingression of all previous actual entities, that make up the world, and which constitute "real" possibilities; and the other which refers to the general potentiality provided by the abstract forms which are eternal objects. In itself each eternal object therefore constitutes "pure" potential, untouched by actuality.

The problems with eternal objects are that to anyone not inclined towards a Platonic intuition about what is required to make things what they are, such objects appear unnecessary, and, ironically, in Whitehead's system they seem to be, not more, but less real than the other Categories of Existence, since as "pure potential" they cannot be experienced. My interest is primarily in the former problem, as the necessity of eternal objects seems to call into question the naturalism apparent in process. Understanding how stable, enduring and fitting entities could exist without them is the second major component of the process alternative to a substance metaphysics. The latter problem, of the questionable reality of eternal objects, is interesting from a doctrinal perspective, which means that to pursue it doggedly would take me beyond my scope; however, some consideration of the relationship between potentiality and actuality in the concrescing entity may disclose in-discrete principles. I will look at this issue in the following section.

On the question of the necessity of eternal objects, Rosenthal sees that it is Whitehead's commitment to a fixed past which requires the fixity of eternal objects to account for novelty. If the past provided everything for the present, she says, then nothing genuinely new which wasn't simply a rearrangement of the past could appear. However since the past is fixed, novelty must result from the intervention of something atemporal and eternal – the future exists in the form of inert, objective real possibilities, and their ingression into events is the source of contingency[318]. Her view does exaggerate, however, the distinction between past, present and future in Whitehead's system, and while I agree that for Whitehead the past, in particular, is more or less fixed, I do not agree that this alone is a weakness that is sufficient to condemn the role of

[318] Rosenthal (2000), p.13.

eternal objects. Further, contingency is not the same as novelty, which, for Whitehead, has connotations of increasing complexity and richness of experience.

Lewis Ford reports Charles Hartshorne's assertion that, given their ambiguity and dubious nature, the wholesale removal of eternal objects from Whitehead's system should prove easier than the apparent deep commitment of the system to them would suggest[319]. Ford disagrees, and claims that the uncreatedness of eternal objects is an essential aspect of their role in the system with respect to the nature of God, and Whitehead's theism therefore depends on them. They play their part in relation to all three of the conceptions of God: whether as the principle of limitation selecting pre-existing objects, as the nontemporal concrescence ordering uncreated objects, or as the primordial nature within a more inclusive divine concrescence. Ford points out that divine transcendence, in its theological context, has typically been understood as the transcendence of time, and the eternal objects can effect this transcendence.[320] Rosenthal and Ford's analyses agree that eternal objects are deeply, indeed irrevocably, embedded in the system, but their responses are quite different. Rosenthal, as will be clear by now, regards Whitehead's process as fatally compromised by its stance towards the atomism of actual occasions, which I have argued against. Ford, on the other hand, takes the theism seriously but wishes to amend it, so I will look briefly at his work.

First, some further explanation of how eternal objects mesh with process is necessary. As Ford points out, "eternal" is ambiguous, since it means both enduring through all time, or the immortal, and also that which is utterly divorced from time, or the atemporal.[321] The latter meaning is truer, since eternal objects were never created, even by God – Whitehead emphasises that they and God are mutually necessary, "for his nature requires them in the same degree that they require him."[322] Although they perform a role similar to that played in traditional metaphysics by universals, they are not the same. By combining subjective and objective qualities the ontological principle is supposed to prevent the dichotomy of mind and world that encouraged the distinction between particulars and universals, hence an actual entity cannot be described only by eternal objects because other actual entities enter into its constitution. Similarly the

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[319] Ford (1994), "The creation of 'eternal' objects.", *The Modern Schoolman*, *71*, 191-222. n.27, p.206.
[320] Ford (1994), p.206.
[321] Ford (1994), p.198.
[322] *Process and reality*, p.257.

ontological principle provides grounds for blurring the immanent-transcendent boundary which once separated particulars and universals, since all objects now straddle this boundary – as a realised determinant of other entities an actual entity is immanent, while as a capacity for determination it is transcendent.[323]

In its role as realised determinant, the actual entity pushes itself into the future, striving to endure physically as it reaches out conceptually to prehend eternal objects which will ensure its satisfaction as the right sort of entity with the right sort of characteristics. Eternal objects hone, shape and limit the concrescence; they act to exclude errant possibilities from emerging, so upon satisfaction being achieved it is safe to say that "there is no character belonging to the actual apart from its exclusive determination by selected eternal objects. The definiteness of the actual arises from the exclusiveness of eternal objects in their function as determinants."[324] Here, the clarity and distinctiveness of the entity as that particular entity is the result of the ingression of eternal objects. These are of two types, which perform different functions: The "lowest" type are sensa, which provide the experienced qualities to clothe the forms realised through the second type, the patterns.

An issue which arose during my presentation of van Haeften's analysis of the continuity of becoming concerns the nature of the pattern that was invoked to explain the "atomicity" apparently evident in the superjective character of the concrescence. The questions that were prompted at that point, which are now subsidiary to the larger question of the nature of eternal objects, were: What does it mean for a pattern to be passed on as a whole? And, is "pattern" a kind of essence, in its role of conferring an identity on the becoming creature? In relation to the subsidiary question of the wholeness of a pattern, "pattern" was loosely defined earlier as that form which is characteristic of an actual entity, which suited discussion of the transition between epochs but which is insufficient in the current context where the nature of a pattern is in question. The intensity of satisfaction that results from the ingression of eternal objects into concrescence depends upon the contrast between those eternal objects; the greater the contrast, the more intense the experience. The more contrast there is, the richer the pattern, and this reflects the already-existing capacity of the entity to individuate itself

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[323] *Process and reality*, p.239.
[324] *Process and reality*, p.240.

by making discriminations, and to sustain the resulting intense experience. The contrast results from the interaction between those eternal objects which are positively prehended, and which make a definite contribution to the constitution of the concrescing entity, and those which are negatively prehended, and which make their positive contribution by being actively excluded[325]. In this sense of 'contribution', what are normally termed "relations" are abstractions from contrasts, and are a species of them[326].

The completeness of a pattern would seem to be a derivative consequence of the relations between those eternal objects that participate in a particular concrescence; they have a characteristic relationship, or "manner", that can be abstracted from their individual contributions to the "matter" of the concrescence. But more generally the concept of pattern refers to any eternal objects that could *potentially* contribute their matter to a given manner[327]. Since all eternal objects are in fact potentials there is no prescriptive limitation on what constitutes "potential", and only a weakly prescriptive understanding that some eternal objects are more relevant to any given final satisfaction than others. Therefore it seems that to take the completeness of a pattern literally as a mark of its unity as a singular thing would be a mistake, since its completeness must be judged retrospectively as the outcome of process, rather than as an independent variable influencing process – in other words, the pattern is not a template, and completeness is not a *requirement* to be fulfilled upon satisfaction. In fact all patterns will be "complete" insofar as concrescence has proceeded without abnormality, and hence there is nothing given about their completeness. Van Haeften's use of "atomic" to describe the pattern can be seen as appropriate to his purpose, and is a description to be found in Whitehead's earlier writings[328], but it is a term that deserves some qualification. At the same time it is possible to think, prospectively, that each pattern is radically *incomplete*, since the "realization" of that pattern is just the concurrent realization of a group of eternal objects.

The second subsidiary question, about the role of pattern as an essence, has been indirectly answered – a pattern is the duration characteristic of an object, and inasmuch as the object recognisably endures, its persistence in that form constitutes its

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[325] *Process and reality*, p.41.
[326] *Process and reality*, p.228.
[327] *Process and reality*, pp.114-5.
[328] Specifically, *Science and the Modern World* (1925), as quoted by van Haeften (2001).

essence, in two different ways. First, there will be characteristic correlations between eternal objects in the pattern, which are prehended as a compatible group and which could be called a "specific essence"[329]; and second, there is the general characterisation of any actual entity, whose whole essence is to prehend, or to persist in becoming[330]. So yes, in a way pattern is essence, since it constitutes that individual in its characteristic individuality, but it has descriptive force only and does not *explain* the individual nature in the way Platonic essence would. The concept of pattern is functioning in a way analogous to the use of the "attractor" concept by those who adopt an epistemic view of dynamical systems theory – useful for a post hoc understanding of an observed regularity, but otherwise lacking ontological force.

The possibility of interesting relations between eternal objects conceived as not fully independent suggests further possibilities for in-discreteness beyond those identified already. It also suggests that an emphasis on the "pure" in "pure potential" can be misleading; that the purity in question does not refer to the individuality of an eternal object considered as an essence, but results from the abstractive purging of all actuality from the concept. This brings us to Lewis Ford and his suggested modification to process to respect the central role of God in the structure of the system, and the emergence of novelty. Briefly, his suggestion is that there is a sense in which eternal objects considered as forms emerge, or are "created", as an element in the concrescent forming of an entity. This is an odd way to think of them if they truly are "eternal", but better is to think of them as atemporal, as noted earlier. This emergence was foreshadowed in my discussion of the nature of the "pattern" which results from the contrasts between prehended eternal objects. The effect of this emergence is to allow creativity to carry forward from one becoming to the next because it is now an aspect of God's eternally ongoing concresence. It becomes another strand that ensures continuity between occasions.

All of Ford's difficulties in conceiving of eternal objects as in some sense created come from the reconciliation of the creative process with the nature of God. This is encouraging for a naturalism which seeks to reconceive (and perhaps discard) both eternal objects and God, though the closeness of the relation between these categories is

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[329] *Process and reality*, p.148.
[330] *Process and reality*, p.41.

itself a problem. For example, one possible scenario is that God nontemporally creates eternal objects. This is already less coherent than Whitehead's own position, since the eternal objects would depend on God but God would not depend on them. However the mutual dependence of God and eternal objects is, thinks Ford, itself incoherent with respect to a larger context, if eternal objects were to be nontemporally created – while the divine consequent nature needs the world for its experience, it is not clear that the primordial nature needs either the consequent nature or the world for its being. Another problem with nontemporal creation is that all possible eternal objects would be required to exist, regardless of the actual course of the world, which would diminish to irrelevance God's role in responding to and directing the creative development of the world[331].

Another scenario Ford considers is one in which God temporally creates the nontemporal eternal objects out of simples. This scenario has significant advantages including the fact that it keeps God and the world tightly coupled, and removes the nontemporal implication that eternal objects must apparently be created out of nothing. However the only available candidates for such simples are those eternal objects called sensa, the pure stuff of sensory qualities, and in their objectivity they offer, thinks Ford (following Charles Hartshorne), rather too much scope for fulfilling God's own enjoyment of the world, which will have the best possible objective aim. This surfeit of objectivity would make the initiative available to God's creatures understandable only as a deviation from the divine vision, which significantly undermines human freedom[332].

Ford's own proposal, mentioned briefly on the previous page, is a variation on the idea of God temporally creating eternal objects, but from within the concrescence and in response to its progress. It is a move which subtly changes eternal objects from having objective, Platonic properties, to being "subjective" or internal to becoming, and hence better thought of as abstractions from it. This move preserves the advantages of the previous proposal, and in addition provides eternal objects with the experiential credentials to satisfy the ontological principle, which they lack when considered as pure possibilities. Most significantly, it allows a better understanding of how novel eternal objects could exist. However as internal to becoming they now lack the ability to

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[331] Ford (1994), pp.215-6.
[332] Ford (1994), pp.216-7.

contribute to ongoing becoming as they would if considered to be more "objective", so Ford's solution to this is to emphasise their creative contribution to God's ongoing concrescence. God, as the only possible source of both actuality and indeterminacy, is therefore also the source of the novelty which is created internally to the becoming[333]. This is a solution which addresses some of the problems with eternal objects, but at a cost of referring their outstanding problematic features "upwards" to the nature of God. The prospects for a process without either type of entity will be considered in the next section.

Process without God and eternal objects?

I mentioned in passing earlier in this chapter that the first published analysis of *Process and Reality*, by Everett W. Hall, advocated the abolition of eternal objects[334]. He was not alone in failing to understand their role[335]. Hall discerns in *Process and Reality*, in contrast with Whitehead's prior works, a heightened role for actual occasions which seems to incorporate much of the functionality of eternal objects. An example of the latter is the way in which identity and permanence (of a sort) can be supplied by the "objective immortality" of an actual occasion after its satisfaction, at which point it becomes a datum for the concrescence of other actual entities. This kind of permanence is qualitative and seems to meet some of the needs supposedly met by eternal objects. Another route to stability lies in the way entities can group together in the form of "societies", which pass on their own relatively enduring pattern. These seem to provide the general and universal aspects of experience. Finally there is the nature of eternal objects as providers of "potential". Hall seizes on the contribution made by actual entities to "real potential", and concludes that this seems to provide all the potential necessary[336]. The short answer to this critique (given by Ford) is that just because actualities can do *some* of the tasks of eternal objects does not mean that they can do *all* of them[337].

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[333] Ford (1994), pp.209-13.
[334] Hall (1963).
[335] Whitehead comments that "everyone" has misconstrued him, in a letter to Charles Hartshorne, Jan 2, 1936. (1963, in Kline, p.199).
[336] Hall (1963), pp.105-9.
[337] Ford (1994), p.193. Emphases in the original.

Hall moves on to address the second problematic aspect of eternal objects, that of their compromised reality which results from not being actual in experience. Here it is a question of the part "abstraction" plays in their definition, and Hall thinks that the thrust of Whitehead's exposition should be towards establishing eternal objects as things in their own right. Since he cannot do this, or provides ambiguous references to their degree of independence, his "hesitancy" in the face of Hall's choice ("Are eternal objects merely aspects of occasions, or do they have a real status of their own when taken by themselves?[338]") is taken as evidence for their compromised status. It is possible that, had Kant been publishing contemporaneously, Hall would have run this line of questioning against the pure concepts of the understanding, with similar results. What Hall would like is a clear choice between the absolute transcendence of universals and the absolute immanence of particulars. His solution is to embed the functions performed by eternal objects in the "focal identity" of each "real thing", but as Gregory Vlastos points out, this move fails to provide the functionality of eternal objects as attractors for the mental pole of an actual entity[339]. It is a misunderstanding both of the dual nature of actuality, and of Whitehead's method of abstraction. In his own more general response to such critics, Whitehead emphasises the relations *between* eternal objects and the corresponding impossibility of conceiving them as completely separate essences; he says "The *absolute* abstraction of eternal objects from each other is an analogous error to their abstraction from some mode of realization."[340]

Doctrinal disputes aside, it would seem to be a major undertaking to remake Whitehead's vision of process without God or eternal objects. Ford, who has a strong interest in process theology, acknowledges the magnitude of a more limited task when he says that "a complete revision of Whitehead's philosophy with respect to the eternal objects would require the reconception of the notion of God, showing that divine creativity can properly be construed as transcendent within the horizon of time."[341] Not only does Ford offer the revision of Whitehead's theory of eternal objects that I have presented here, but he defends eternal objects against the criticisms of sceptics like Hall, and I will briefly consider his defences below. Given the magnitude of the task of

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[338] Hall (1963), p.111.
[339] Vlastos (1963), n.12, p.166.
[340] Letter to Hartshorne (1963, p.199). Emphasis in the original.
[341] Ford (1994), p.206.

revision, my subsequent suggestions cannot be true to process *theology* at all, and will retain only the core notions of becoming and novelty preparatory to my attempt to paint a more inclusive picture in the next, concluding chapter.

Novelty is the most emblematic feature of eternal objects that must be accounted for, because of its pre-eminent role in process metaphysics quite apart from any theological importance ascribed to it., By adding value and novelty to Hall's original list of identity, permanence, abstractness, universality and potentiality, Ford offers seven characteristic functions of eternal objects; he also partly counters Hall's attempts to explain away the unique relevance of the first five characteristics[342]. *Identity* and *permanence*, he agrees, can be understood easily as the outcome of the genetic inheritance of the influence of the prior states of the actual entity, so these functions of eternal objects could be fulfilled in other ways. Eternal objects considered as singular things are of course highly *abstract*, but this is not the correct way to think of them; it is the purging of all actuality, including time, that makes them abstract. Ford concludes that in this respect abstractness is a necessary feature of eternal objects, but it would seem that inasmuch as they result from a method of abstraction this feature is a guaranteed outcome of the method. *Universality* is a traditional metaphysical preoccupation, but the overriding emphasis on the unrepeatable creativity of novel actual occasions makes a simple dichotomy between universals and particulars inappropriate in a process context – just because actual occasions pass on their characteristics as repeatable particulars to create novel unrepeatable particulars does not obviate the need for a repeatable something that is nevertheless not particular; that is, a necessary third category, of repeatable universals. Ford's own suggestions for reconceiving eternal objects serve to highlight the role of this third category, and thereby to underscore the importance of universality as a function for eternal objects. The function of *potentiality* that can be ascribed to eternal objects is their most prominent, unique contribution to process, and here Ford agrees with Vlastos, that Hall failed to understand the core mutuality between the physical and mental poles of actual occasions. Hall's consequent attempt to delegate the functions of eternal objects to the ongoing actualisation of entities therefore critically downplays the importance of the subjective aim that is lured by the *pure* potential of eternal objects.

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[342] Ford (1994), pp.194-5.

Ford's additions to Hall's necessary functions for eternal objects are that they contribute value and novelty. Both of these can be seen as elaborations of the incompleteness of entities expressed through their subjective aim; that is, both lie beyond the concrescing entity[343]. *Value* expresses that attribute of possibilities, that some must be better than others, but more than mere possibility it represents a long-held hope that such ideals are transcendent. In similar but less remote fashion to Plato's Forms, Whitehead's eternal objects operate outside time. Finally there is *novelty*, that function above all for which eternal objects are required. Like value, the concept of novelty could be seen as assimilable to the concept of possibility, as being a consequence of the existence of options considered as a multiplicity of sorts, but it requires something of a leap of faith to accept that mere rearrangement of existing things can result in new things by chance alone. Hence the existence of novelty as an irreducible category seems required.

Of the apparently necessary functions for eternal objects, some are found to be adequately provided by the concrescing actuality (identity and permanence), some are of dubious provenance because they too faithfully reflect the methodology adopted to justify them (abstraction), and some are so bound up with the nature of God that their removal seems almost unthinkable. Those functions which survive this culling process are universality, potentiality, value and novelty, and they have something interesting in common – they all represent aspects of the distinction between actuality and what precedes it, usually described as possibility. This is a distinction that Henri Bergson traces to a fundamental misunderstanding of the nature of novelty in his essay "The possible and the real"[344].

When Lewis Ford considers the implications of his own suggestion for eternal objects (the suggestion being that they originate "subjectively" as part of concrescent forming and have objective significance only upon satisfaction) he concludes that this means that any novelty exists, in a sense only, in actuality before it is abstracted as an eternal object. He wonders in passing if this "counter-temporal" process is what Bergson was driving at in his essay[345]. This is indeed the kind of metaphysics

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[343] See Ford (1994), pp.195-7.
[344] Bergson (1946c), "The possible and the real", in *The Creative Mind* (pp. 91-106).
[345] Ford (1994), n.31, p.212. The term "counter-temporal" is my own gloss. It isn't clear whether Ford sees Bergson as supporting or critiquing a position such as Ford's.

Bergson criticises. Such a metaphysic arises because of a unreflective faith in a mechanistic, deterministic worldview, which consigns novelty to the gap where mechanism ceases and poetry begins. This worldview regards all probability as classical, and all deviations from expectation as merely chance. Of course it is easy to see the possibility of a double-six as already contained within the becoming of two die when rolled, so no wonder we regard all actual events as somehow ushered in by a host of possibilities which, as it were, stand or are pushed aside at the moment one of them becomes actual. When Whitehead accepted the relevance of quantum mechanics what he took from it was unimaginably fleeting existence, not essential indeterminism, and although his organic philosophy is far from mechanistic it nevertheless retains that respect for possibility as in a real sense "almost actual".

The proper way to think of novelty, says Bergson, is to recognise its fundamental role in the creation of reality populated by living, conscious beings. There is a divide between such beings and a material world, where the material world is characterised by deterministic repetition, and the rhythms that shape the living. Duration, on the other hand, is the hesitant reaching, or groping, of living beings towards novelty, and it must by its nature be indeterministic. The combined effect of countless creatures in duration is the in-discretely continuous production of novelty, and on this view, reality is full; it is "global and undivided growth, progressive invention, duration; it resembles a gradually expanding rubber balloon assuming at each moment unexpected forms"[346]. There is no prior moment which is not itself pregnant with novelty, no before to which it would make any sense to say of it that actuality has not yet been achieved. Yet we insist on applying methods of thought derived from abstracting and detecting repetition, and that remove change as a distraction. These methods result in a view of reality as an empty space into which actual things are placed, coupled with an exaggerated respect for two significant "pseudo-problems" of metaphysics. The first pseudo-problem is the question "why is there something rather than nothing?", which is a problematic understanding of Being as contrasted with non-Being, associated with the belief that nothingness supposedly precedes Being. The second pseudo-problemic question is "why is there order rather than disorder?", which signals the fascination of intellectual thought with finding regularity in reality. On this last point, Bergson makes a

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[346] Bergson (1946c), pp.95-6.

prescient observation perhaps inspired by Boltzman's thermodynamics but not empirically confirmed for some decades: the observation that *disorder is relative*. Disorder is a term with bite in the ordered world of fabrication, but not in the world of novel creation: "Disorder is simply the order we are not looking for."[347] I will have more to say about this soon.

The two pseudo-problems referred to above are in reality just facets, according to Bergson, of a single illusion, namely that there is *less* in the idea of the empty than the full, and *less* in the idea of disorder than order. Since the intellect must do work to impute multiple existences and multiple orders which underlie the real, there is actually *more* not less in the idea of possibility than in reality: "For possibility is only the real plus an act of mind which throws its image back onto the past." Hence to look ahead and think of future actuals arising out of current possibles is to misunderstand the true role of novelty, and to overstate the nature of the moment of coming into existence which supposedly marks the conversion from multiple possibility to singular actuality. Those rare philosophies that have left some room for indeterminism and freedom have generally failed to appreciate their full implications, since they have conceived indeterminism as competition between possibles, and freedom as choice between possibles, when it is the real which makes itself possible, not the possible which becomes real[348]. This "bootstrapping" image of reality is taken seriously in dynamics, and as a form of nested in-discreteness it will be returned to more fully in the next chapter.

The prospect for a process philosophy without eternal objects has only been scouted here, and has not been directly confronted. The belief in their necessity has been shown to be traceable to certain preconceptions which may not be compatible with a fuller appreciation of the role of novelty, particularly as those preconceptions depend upon an understanding of possibility as metaphysically prior to actuality. Of the four functions of eternal objects which survived my culling process, potentiality and novelty can be seen as in-principle understandable within a worldview that places novelty at or near its centre. Universality and value seem more intractable, though both have interesting connections to the idea of relativity – although relativity is constitutive of

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[347] Bergson (1946c), pp.98. Note the interesting congruence with Leibniz' "uniform and constant function" which can be found to pass through any given subset of points in space.
[348] Bergson (1946c), pp.104.

both concepts, in themselves they would seem to be emblematic of the absolute and to represent denials of the relative. That other element of the Bergsonian metaphysic, duration, may have the resources to assist here. In the following section a synthesis of relative elements contributing to novel becoming will be sketched, prior to its elaboration in the concluding chapter.

5.4 Some critical relativities – the future, novelty and duration

Process embodies a proto-structural principle of connection which approximates continuity. As such it is the epitome of an in-discrete metaphysic, but there are many other ways such principles are manifest. There is no particular way in which in-discreteness should or must be apparent in process or in any other form, just as there can be no prescriptions about how in-discreteness should be elaborated into a more encompassing system. Consequently there are many ways in-discreteness could manifest in a more developed metaphysical system, but some of those ways have discernible interdependencies that make some combinations of features more likely to be productive than others. Although it is difficult to think of instances where in-discrete features must fail to cohere, one possibility might be an attempt to embed a nested process within overlapping strands – this might be thought, for instance, to be a useful way to describe how general cultural influences spread progressively (nested in-discreteness) through distinct but not unrelated social groups (overlapping strands in-discreteness). This would seem to be a forced application of in-discreteness because the spread of influence, considered solely as a growing unity, is derivative from the direct take-up of culture by each group – the nesting concept adds little or nothing to the understanding of the phenomenon. More likely is the realisation that discrete and in-discrete features are usually incommensurable, and that the discrete component can be productively re-described as in-discrete.

A move from discrete to in-discrete principles can be seen operating in the development of understanding about what concepts are. It would be difficult to argue, for instance, that invoking the idea of overlapping strands in-discreteness is the proper way to characterise the connectivity of concepts, while also insisting on the idea of concepts as bounded container-like categories. On such an approach, it would be necessary to look to some additional factor or factors (themselves antithetical to in-

discreteness) in order to explain how categories came to be bounded, in what that bound consists, and how categories overcome that boundedness in order to be connected. More likely, the bounds (and the formal relations made necessary by the positing of bounds) would be explained away as artefacts of previous discrete theorising. This transition has occurred for the understanding of concepts, where the bounded conception could not survive the findings of psychologist Eleanor Rosch that many concepts are defined by a central tendency towards resemblance and the absence of necessary and sufficient conditions for that resemblance. These departures from discreteness suggested to Rosch that concepts are related by "family resemblance" in the way identified earlier by Wittgenstein; hence the very idea of bounds as the necessary container for a concept became untenable[349]. The most likely outcome, therefore, is that in-discrete features will be found together in productive combination.

The following general features are characteristic of the in-discrete approaches investigated in the present work: novelty, dynamism, indeterminacy, and connection. All of these features can be thought of as continua capable of accommodating the very little, the very great, and the possibility of discontinuous transitions between them which do not create gaps. Hence the descriptive power of in-discreteness is very wide-ranging: The identical and the uncategorisable face each other along a dimension of novelty; the static faces the frenetic; the fully determined opposes the multiply characterisable, and the discrete opposes the continuous. The approaches that exemplify in-discreteness to varying degrees are process philosophy, pragmatism, ecological psychology, dynamical systems theory, and Bergson. One thing that sets all of these apart is their attitude towards something that apparently has little connection with the concept of in-discreteness – this is the future. In turn, and not coincidentally, consideration of the future brings with it consideration of a number of questions that implicate the in-discrete characteristics listed above – what form the future takes (novelty, indeterminacy), how the future interacts with the past-present (novelty, dynamism, indeterminacy, and connection), and why the future matters (novelty, connection). There are any number of

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[349] See the early dispute between Rosch (1975a, "Cognitive representations of semantic categories."; & 1975b, "Reply to Loftus") and Elizabeth Loftus over the nature of concepts (1975, "Spreading activation within semantic categories: Comments on Rosch's 'Cognitive representations of semantic categories'" All papers are in *Journal of Experimental Psychology: General, 104 (3)*) Note that Loftus' counter-proposal, spreading activation, was also innovative as it was motivated by connectionism, though she emphasised the discrete and static nature of a network.

reasons why a philosophy should have something to say about the future – questions about responsibility, action, planning, creativity and freedom all demand a response from a state of the world at some later time. Given some fairly minimal demands for coherence and justification, there are good reasons why whatever a philosophy does say about the future should be systematic, and grounded in principles that are more immune to dispute than the nature of the future itself, at least. In short, the future should be an element in any metaphysic.

One thing the future certainly will be is novel. It will not be just more of NOW… It was necessary in the previous section to discuss an alternative understanding of novelty, due to Bergson, in order to appreciate why the eternal objects posited by Whitehead may be an incorrect way to think about the role that the concept of possibility plays in process theory, and I will not reprise that discussion here. Far more importantly than their interpretation as carriers of possibility is the role of eternal objects as shapers of relevant novelty, however. The production of novelty is the central theme in process, and it is this, rather than change or flux as such, that is the core of the process intuition. Once novelty is installed as the core productive principle, then change must follow. The challenge has always been to understand how what we confront as things change is largely similar to what we recall of those things changing and developing in the past, and yet is also different and new. A metaphysic will have a productive principle which explains, or accounts for, the creation of the new, and it is usual for this principle to be uncontaminated with any taint of "effectiveness" or "efficiency", or other aspects of feedback from the world.

The ontological principle, "expression", a "life force", and "energeia" are all outward-directed ideas; they may be countered by other forceful notions but those negative principles are foreign to them. It is also usual, therefore, to consider a separate principle that puts a brake on production, which balances it, not in an accounting sense of numerically-equal-but-opposite, but in a contrary sense, of opposing its tendency. To be sure, those metaphysics that put a premium on production also tend to grant the producer superlative powers to ensure that production is directed to the best ends possible, such as the systems of Spinoza and Leibniz, or which orient the dynamics of the system towards an inevitable conclusion, such as Hegel's dialectic. Hegel takes the principle of opposition (negation) to its dizzying conclusion, but without his metaphysical innovation and his concern for the absolute most systems make do with

something simpler and less deterministic: a productive principle, plus some mechanism for limiting and/or directing production. I will briefly discuss in these terms each of the candidate in-discrete approaches identified above.

For pragmatism the productive principle is a strong *orientation* towards the future, an orientation often though not exclusively identified with human beings, their psychology, and their projects. This orientation is expressed variously by Peirce, James, and Dewey as effects, purpose, optimism, or promise. In defence of his belief that effects are the primary constituents of our knowledge of objects Peirce quoted Jesus: "Ye may know them by their fruits."[350] Dewey offers a similar interpretation of the shortcomings of an exclusively materialist attention to causes, in a passage quoted earlier – there he concluded that "'Effects', since they mark the release of potentialities, are more adequate indications of the nature of nature than are just 'causes'"[351]. James talks of theories as "instruments", and of the "cash value" of ideas. It is characteristic of pragmatism that orientation towards the future is not cashed-out in terms of a unified metaphysical account, so considerable latitude in interpretation is possible. Here the concept of "effect" is deliberately ambiguous between the teleological anticipation of a desired state, and the actual consequences of aiming for such states. The counter-productive principle for pragmatism is not explicitly identified as such, but it is intimately related to the productive principle, as suggested by the ambiguity of "effect". Therefore it can properly be seen as recognising the inertia of the world, its resistance to being affected; and more particularly, the ineffectiveness of knowledge and actions, the blunting of optimism, the mechanising of purpose, and the nondelivery of promise.

Ecological psychology, which was influenced by pragmatism[352] but is explicitly non-anthropocentric, invokes *movement* on the part of organisms as its productive principle, since it is in movement that the interests of the creature are expressed and the information flow of the environment is sampled. Movement results in the need for choices between affordances, and each choice results in an outcome characterised by low-key novelty. Although repetition of outcomes can be a feature of movement, so that plucking one berry is indistinguishable in principle from the act of

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[350] Peirce (1893) Quoted in the editor's introduction to Peirce's "What pragmatism is", (1958b), p.181.
[351] See n.270
[352] And also very probably by Merleau-Ponty's phenomenology; see David Morris (2004), *The sense of space*, (Albany, NY: SUNY). p.185, n.24.

plucking its neighbour, nevertheless the two acts are different. Spatial proximity is no guarantor by itself that repetitive acts will be appropriate, as anyone will appreciate if they have watched a small honey-eating bird perform intricate contortions in order to penetrate the depths of adjacent flowers, or a dog nosing determinedly around an interesting patch of ground. For creatures such as these, exploratory behaviour is finely attuned to the particular requirements of the territory, so that all acts are novel. Impediments to movement constitute the counter-productive tendencies, though there is little of metaphysical significance here – these can be seen as failures or shortcomings in the acquisition of skills and knowledge, or if conditions have changed, as a lack of fit between the organism's abilities and the capacity of the environment to sustain those abilities. This is a restatement of the counter-productive principle applicable to pragmatism; that the world can resist, that there are no guarantees of success, but nevertheless there is an imperative to continue moving into unforeseen circumstances.

One of the achievements of dynamical systems theory has been its ability to describe the emergence of novel states when open but constrained systems are pushed away from an equilibrium state. This has enabled a reframing of the understanding of how the new can emerge as a discontinuity from the old, and has naturalised novelty at the same time as it has given us new tools to understand how regularity lies close beneath the surface of irregularity. The productive principle here is basic – it is the dissipation of energy. There is a sense in which thinking of it as basic does away with the need to invoke a productive "principle", since in-discrete connection between heterogeneous elements plus energy seemingly contains the seeds of productivity by themselves. However it is also apparent that conditions have to be just right, within quite narrow parameters in many cases, for any production at all let alone novel production to occur. Therefore, once again in common with pragmatism, the counter-productive tendencies are legion, and are simply the world and its resistance to change.

Whitehead is more explicit about the necessity to restrict productivity, just as he is explicit about all things metaphysical; without such limitation, sheer difference, blindly hurled into the world without consequence, would overwhelm everything. Without *relevant* contrast, there is no-thing. Bergson's view on this is less explicit. His metaphysic is primarily oriented towards the living and organic, which is also the conscious, but importantly the scaffolding of the world is the repetitive duration of the inorganic, the regular sameness upon which the boundless creativity of the living is

displayed. In both these more explicitly process theories the inertia of existing, repetitive and relatively unchanging structures of the world applies a brake to productivity and channels creativity into salient formations.

Every particular thing or event is a novelty, regardless of how one regards the discreteness or otherwise of its nature. It is novel not just because it is THAT thing, numerically distinct from all others, but because in countless ways it can be found to differ from all other things. Although all the approaches identified above have invested in in-discrete thinking, it is noteworthy that all of them have a story to tell about a fundamental distinction between the relatively fixed and permanent features of the world and the novel and changing features. Generally the relatively stable is identified with hard, rigid physical matter which is subject to very long timescales of becoming and a very low propensity for producing novelty – such material, though not completely unchanging, does not respond in the way characteristic of organic, living entities; as Whitehead notes in a comment quoted earlier, "inorganic entities are vehicles for receiving, for storing in a napkin, and for restoring without loss or gain."[353] Similarly, Bergson talks of the inorganic world as a series of infinitely rapid repetitions of duration which "enframe" the living and provide the constant rhythm against which variable living duration is measured[354], while James Gibson highlights the ecological information derived from the difference between the variability generated by self-movement and the constancy available from the environment. The distinction between the organic and inorganic cannot, however, be made too impermeable, since in a most literal sense the former must regularly incorporate, and hence be partly constituted by, the latter in order to survive. The distinction comes down to a question of the relative sensitivities of the materials involved, and this is cashed out in a number of ways.

The most explicit account of this kind of sensitivity is to be found in *Process and Reality*, and here it is expressed as the "feeling" of the conceptual pole of an actual occasion for what lies beyond it; in this case, a pattern of eternal objects, towards which the concrescing occasion advances. The more complex the occasion, then the more complex is the pattern at which it aims. Its creative advance just *is* the creation of the future. For ecological psychology the sensitivity is more banal, but also correspondingly

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[353] See n.315
[354] Bergson (1946c), p.92.

more vital to the interests of the moving creature. It must accurately judge the capacity of the environment to fulfil its needs, and to do this successfully it must be sensitive both to the availability of resources and to its own state of preparedness. For most activities, but not all, the future is within the limit of sensory systems. In both of these accounts there is a definite idea of a reaching-out, which could also find application in pragmatism's concerns about the "promise" of the future, and the effects of actions.

Bergson links duration directly to the relation between novelty and searching; that is, duration results from the need that living beings experience, as their elaboration of reality is inevitably coupled with a need to search and select among the options. He describes this as a "groping" for the future, so that "time is this very hesitation"[355]. There is an element of matching or resonance between perceiver and world in the way duration operates for Bergson, disclosed above in the relation between multiplicity and unity in duration, and here there is an interesting involvement from the faculty he calls "attention". I hesitate to describe this unambiguously as a reaching because there is a strong sense in which the future comes with the object, as partly constituted by the object's own duration rather than as an integral constituent of the reaching itself.

Finally, dynamical systems theory is a notable exception among its indiscrete stablemates. The concept of "attractor", or "basin of attraction"[356], seems readymade for a pseudo-teleological explanation, as it seems to describe the target state at which dynamical systems aim. This interpretation must be resisted. The attractor concept operates in analogous fashion to the idea of an "adaptation" in evolutionary biology, in that it seems obvious in retrospect that a particular state was suited to its environment, and this suggests a directed process which happened to culminate in that state; a process with some form of intentionality which homed-in on the attractor, so to speak. But recall Bergson's warnings about the readiness with which we misunderstand the concept of possibility, when we fail properly to appreciate novelty – we forget that depictions of dynamical systems are descriptions of a huge number of combinations of parameters, operating over very many time-steps of progressive change. There is no special one-ness being tracked from its beginning to its final, attractor-bound state. Instead there are very many tiny increments shaped and constrained by just some combinations of all those

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[355] Bergson (1946c), p.93.

[356] See the section on dynamical systems theory in Chapter Four. There will be further discussion of attractors in the final chapter.

parameters, and driven by energy dissipation. Reading the concept of possibility into those paths not taken is an intellectual error.

However there are both a stronger and a weaker sense of sensitivity which can be rescued from DST, and these relate to the incompleteness or open-endedness of a dynamical system. Just as a hungry creature cannot afford to rest, due to the possibility that food may become available, so too is a system under pressure to dissipate energy unable to simply "rest" in an equilibrium state. The attractor state represents a region of relative stability which optimises energy use[357]. Many systems have more than one such relatively stable state available, and can be "nudged" by a minor influence away from a typical and perhaps stable state towards an atypical and relatively less stable state. In this strong sense they may exhibit a sensitivity to changes in their environment, well-captured by popular talk of the "butterfly effect" on weather patterns. If the system spends much of its time flipping from one semi-stable state to another it is hyper-sensitive and may be regarded as "chaotic". In a weak sense of sensitivity it is apparent that a system poised unstably away from an equilibrium state may be susceptible to influence from any number of sources, and it therefore exhibits a global sensitivity or readiness to change. There is a strong sense of compulsion operating here, which in a discrete mechanical system would clearly manifest as necessity, and this is why dynamical systems are regarded as deterministic; yet their outcomes are not in-principle precisely determinable. Hence it seems that the sensitivity of entities for "feeling" what they require is correlated with, and perhaps consequent upon, their lack of completeness.

Incompleteness or open-endedness is certainly a feature of Peirce's concept of duration, which spans an indefinite number of moments, but is less obviously so on Bergson's formulation of the concept. Duration plays a critical part in the effort to understand how continuity exists in the world, but it had its beginning in efforts to understand how the future can play a part in the constitution of the present. It provides a number of in-discrete attributes to the metaphysics of connection, though not all of these can be found in every characterisation of duration: (1) It has a difficult-to-categorise duality, with event-like characteristics as well as an object-like nature; (2) It is a synthesis of unity and multiplicity, yet it consists of at least three different things which

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[357] The spatial sense at stake in talk of a "region" is very general, as the space in question is a mathematical space defined by the parameters which shape the system's behaviour.

give it qualitative character: A beginning, a process, and an end; (3) It is seldom found alone, as an isolated entity, and when operating with other durations it seldom marches in lockstep with them; in this form it exists side-by-side in the form of overlapping strands. It shares these three "morphological" features with the dual nature of actuality in Whitehead's account of process. Critically, it shares a fourth feature, less structural than qualitative: (4) Duration occupies an ambiguous ontological space which straddles, or unites, the objective and the subjective. It is something that can be predicated both of a perceiver and the object perceived.

As something which implicates both the perceiver and the perceived, duration represents a relational notion of essence, in the sense of the persistence in being noted by Spinoza, Bergson and Whitehead. Responding to duration is therefore a matter of one being influencing another, either alone or severally. The more stable and permanent beings will trap and concentrate the causal powers of those less permanent, in the way that it may take millions of ants to eventually fell a tree, but there are no immutable principles dictating that they cannot do it. The permanence of the tree is an expression of the relation between its own duration and the cumulative impact of the countless organisms and events the tree will encounter; it is an expression of the relativity of duration. This formulation of duration is more compatible with Bergson's than with Peirce's and Whitehead's understandings, since both the latter thinkers were thoroughly influenced by infinitesimals. Of course, "infinitesimal" could name any of an infinite number of durations within a range of lengths, but the intention is that such duration be too short to register as any possible experience.

As infinitesimal, duration loses much of its explanatory power since its nature now becomes an abstraction from some other mode of being which is inexplicable in terms of duration, and it requires a further mechanism to account for apparent permanence. Infinitesimal duration allows overlapping strands to constitute a thick present and an undetermined future, but for Peirce and the pragmatists, on balance[358], the locus of duration is within the interpreting agent. What results is "temporality" as distinct from "cosmic time", though it would be a disservice to pragmatism to over-emphasise the psychological internality involved. Nevertheless

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[358] As noted earlier, the "interpretive activity" conclusion is made reluctantly and in qualified fashion by Sandra Rosenthal. See n.305

duration as conceived in this way has been homogenised into an element of perceptual functioning, since all duration, as infinitesimal and therefore too brief to be experienced, is effectively the same. The resulting "rhythm", to extend Bergson's idea somewhat, would be a constant high-pitched background hum that accompanied perception. There would be no differentiation, no modulation. Whitehead's use of infinitesimal duration has even less experiential content than Peirce's, since for him it is the vehicle for introducing determinateness into the world in the form of an in-principle "arrest" at the completion of becoming, where just for an instant beings have that independence demanded by standard views of causation. These views of infinitesimals are true to the concept of a "world in flux", where "flux" names raw, undifferentiated change. They contrast with Bergson's own position, which is that the experience of duration is a real experience of the world. Duration is a form of relative invariance that marks the persistence in being of an object, and Bergson's world, rather than being in flux, is in rhythm. It beats out time.

Duration as a form of invariance is a global characteristic of a world which includes the perceiver. The perceiver too is a durational entity, and presents as relatively permanent to the world. The idea of global ontological relativity places the idea of invariance in relief, since invariance (in spite of its name) can make no claims to permanence in such a world, and a relative world composed of relative "invariances" is recognisably our own world. Shorn of the concept of duration, this is also the kind of world described by ecological psychology. Instead of duration, ecological psychology utilises the concept of "affordance" to convey the similar idea that perceiver and perceived are in a mutually-conditioned relationship in which relative stability is highly informative and of enormous practical value[359]. "Relative stability" also encompasses recurrent structures like seasonal variation in the navigability of routes, the availability of mates, and the edibility of foods. Relative stability, of either a fixed or recurrent form, is a guide to value, since it reliably represents an opportunity to be associated with positive outcomes. If that formulation seems too vague, consider relative stability as representing a precondition for the formation of associations. In either form such

[359] The concept of invariance in ecological psychology will be discussed in more detail in the final chapter. I am using "affordance" as a more encompassing term which suits the generality of the current context.

stability is the basis for prediction, exploitation and control – in short, for the ascription and extraction of value.

Pragmatism and ecological psychology both associate the management of value with the projection of the agent into a future. Although Peirce's concept of duration does work to deliver an immediate future blended seamlessly with a past-present, the emphasis on infinitesimals means that the future so blended is not of a piece with the kind of future about which humans tend to be optimistic or pessimistic. The scale on which an optimism about the future has effect is very much longer than the scale that the metaphysical apparatus available to pragmatism can deliver. It is the overlapping continuity of countlessly many durations stretching into the future, united by a cognition, which supplies the relevant scale. Peirce's theory of signs is a way of building on the relativity of duration to increase the scale and complexity of the relation between world and perceiver. The most immediate relation is between something as it is in itself, and a naïve registration of that quality. The resulting ideas are sensory qualities and feelings, which have significance because of their direct impact on a perceiver. These ideas of "Firstness" include the idea of a present moment, and ecological features such as "hardness", but they are not associated with any pragmatic aim of utilising or responding to the qualities, so this is not a precursor of the concept of affordance.

Next is the mode of being of that which is as it is, but with respect to a second being. Here the relativity constitutive of these ideas of "Secondness" is most apparent, since at base they involve experiences of causality, of action and effect, though in an unreflective way. An example Peirce gives is the experience of effort, which does not exist without an experience of resistance. He reserves the term "experience" rather than "feeling" for these more complex interactions, which often mark the transitions between feelings. Hence experience is that which is forced upon the perceiver, and which the perceiver is compelled to accept – "brute action", in other words, is the mark of Secondness. Affordances considered simply as relations between agent and environment are clearly dyadic in the sense Peirce applies to his ideas of Secondness, but considered more comprehensively as also including the activities of searching them out and making the decisions which mark any clash of priorities, affordances are not well-accommodated in this category.

Finally, Thirdness names the mode of being of that which is as it is, in bringing two other beings into relation to each other. It always involves a mental

element. An example is the relation of "giving", where one thing passes from one being to another. More generally, Peirce regards a "sign", a sort of Third, as something which brings a feeling (a First) into relation with an experience (a Second)[360]. In this regard he might allow that affordances operate as signs indicating the possibility of certain forms of experience, though this interpretation would be rejected by followers of Gibson because of its dependence on the representational content of the sign. The progression from Firstness to Thirdness, although expressed in superficially discrete terms based on the apparent distinction between three different levels, is in-discrete in two ways: Each mode of being incorporates and rests on its simpler counterparts (nesting), and each consists of a multiplicity of parts rather than a unitary state of being (overlapping strands). Each mode of being is itself relational, arising out of interaction between things.

This section has discussed some foundational concepts preparatory to their integration into a more coherent, encompassing story about in-discrete connection. The future, novelty and duration all seemingly make reference to time, but it turns out that each of them, when considered as relational, operates upon an in-discrete entity already characterisable as open or incomplete, and already with an orientation towards an ever-moving completeness. This base state is outside so-called "cosmic time" and its orientation is a key factor in the movement towards a future.

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[360] Peirce (1958c), "Letters to Lady Welby", pp.383-9.

Chapter Six – In-discreteness, Process and Indeterminacy

Atoms and the void together make up reality, or so said the Atomists. Their vision was of a multiplicity of discrete objects that combined to make up the world of appearances, and between those things was no-thing, emptiness. All genuine creation had already taken place, and novelty was merely apparent, being simply the rearrangement of the pieces. From discreteness only further discreteness comes, and if novelty is only apparent then any difference from what came before is easily explained away – it is either benign and irrelevant, or else malign and an error. Errors arise from failures of reproduction and combination, and if some of these should prove beneficial to the future of an entity, then that is a happy accident which can be conceptually separated from the production of the error. The productive principle in a discrete metaphysic is mechanistic, involving simple operations that deliver outcomes of reproduction and combination, resulting in creatures which are complete and bounded, substantial and determinate. The immediate implication of discreteness is the possibility of its denial through the availability of transcendence: bounds can be exceeded or crossed, completeness can be augmented or overcome, and finitude can be contrasted with infinitude. Indeed, in order to connect discrete entities some such transcendence *must* be countenanced. The very idea of a systematic whole which has identifiable parts requires the limited mechanisms of the parts to be transcended by something more encompassing.

An in-discrete metaphysic is quite different. The fundamental distinction between entities and the emptiness between them is broken down, and in terms of connection this was the initial attraction, but more important is the consequent breakdown of the fundamental distinction between space and time. Reality is composed of event-like entities and entity-like events. Influence is spread across space and time. The production of in-discreteness necessarily exceeds any bounding, temporal and spatial. It is not mechanical but “organic”, in Whitehead’s sense, because all reality is on the model of an organism; interdependent, interconnected, growing, changing, and incomplete. This is process, the metaphysic that results when in-discreteness is taken to its limit. Three related implications of taking in-discreteness to the limit have been pursued in this work. The first is that while reality has infinite depth it does not have necessary divisions that mark off layers within that depth. The traditional distinctions between immanence and transcendence, and between universals and particulars, which

pay heed to absolute distinctions of depth and duration between appearances and the real, or within the real, are therefore reframed as an ontology of *relative depth* and *relative permanence*. This ontology, in the most general way possible, is one of spatiality. It is an ontology of entities, related in some form of ordering. Second, reality is full, and more of it is being created continuously. This creation is novel and unique, and stretches the present moment into the future. The traditional distinction between subjectivity and objectivity, required in order to distinguish the creative and undetermined from the repetitive and determined, and the possible from the actual, is therefore reframed as an ontology of *relative determinism*. It is an ontology of production. Together, relative depth/relative permanence and relative determinism imply a third feature, which has also been a factor in this discussion – a densely-ordered spatial reality which at its temporal limit is ceaselessly creating novelty will not only be one in which causal relations imperfectly allow prediction and control of the future, it will also be one which is in-principle unable to be precisely described, resulting in multiple and overlapping determinations. Densely-ordered novelty is therefore indeterminate, and the traditional distinction between determinacy and chaos is reframed as an ontology of *relative determinacy*.

The critical relativities discussed at the end of the previous chapter were there found to be in-discrete features distinctive of a number of systems that exhibit in-discrete tendencies generally. The future, novelty and duration were the locus, so to speak, of their in-discreteness, those aspects which set them apart from substantialist and idealist approaches and their modern counterparts which demand discreteness as a foundation for reality, either in the world as world, or in the world as mind. Each of them is, however, explicable in terms of the deeper relativities introduced above, and I will briefly introduce this relationship before elaborating on these deeper relativities.

Time is a puzzling thing, and the future is the most puzzling of times. We can map our past onto the objective past shared with others and interleave our stories with theirs, and we can unreflectively share our present with others, but our future exists nowhere but in our imagination. At least, this is how it seems if we take seriously the idea that the present is a so-called “knife-edge” which sharply divides the determined past from the undetermined future. Introducing the idea of duration, especially when considered as non-infinitesimal, presents the opportunity for in-discrete overlapping of durations, which smears and spreads the present moment into a moving unity of

durational elements. Investigating this present in detail means pursuing nested structures to ever-finer depths of granularity, or ever-larger structures of generality. On the fringes of experience are the relatively enduring patterns that will shape and constrain production by combining raw materials and influence carried over from the present. Investigating these patterns means finding more-or-less permanent structures which influence the production of the real, and appreciating their incomplete control of this production means constantly finding relevant difference. Prediction, control and description of production will be possible, but always within limits, and never ultimately unique and precise.

6.1 Relative Depth, Relative Permanence

The provision of stability has always been a prime motivator for belief in universals, and "stability" has served to anchor one pole of a near-continuum which has "flux" as its counterpart. I say "near-continuum" because although the existence of degrees of stability is widely acknowledged and unproblematic, traditionally there has been a discontinuity at a point somewhere between those poles. The world of flux is the world of particulars, the empirical world of appearance, sense experience and change, and in this world where butterflies flit and trees endure the idea of relative permanence is easily accepted. The varying dependencies of each thing on some or many other things is also widely accepted; this is the world of causation. The earth and the sky are the constantly changing sources of important variability, yet they are also comfortingly unchanging, constantly there. Cyclical change marks every day, month, season and year, always changing and yet in many vitally important ways the same. On the other side of that discontinuity lies a radically different part of reality, the really real, where "permanence" means being atemporal, or outside time, as the discussion of Whitehead's eternal objects revealed. For entities on this side of the discontinuity temporality and change are completely foreign; there is no possibility of "relative" permanence in the idea of permanence. If atemporality is a limit case of temporality, then the discontinuity lies almost at the pole of permanence. This atemporal world is ineradicably intertwined with the appearances. It does not exist side-by-side with the appearances but instead exists, in a curiously different way, *in* the appearances. There are some interesting ways to think about this relationship which are beyond the scope of this project, but my purpose here

is to focus on a structural feature of the relationship and to propose some ways in which in-discreteness offers productive alternatives.

In light of that discontinuity a continuum is not the best way to think of the relationship between universals and particulars, or between permanence and evanescence. The best way, encouraged by that absolute distinction assumed between them, is to think of a hierarchy of levels, where movement towards the apex is movement away from temporary and complex mixtures of short-lived particular things, towards the simple, the pure, and the eternal universals. Universals are discovered by rigorously abstracting away from particulars all vestiges of their impermanence and particularity. That it is an act of mind which apparently reveals universals in this way and grasps them as entities in their own right is hugely significant – on this way of thinking, perception is a discrete process that allows a common feature, thought, to bridge the gap between the sensory external world and the cognitive internal world. So much for the standard picture. This current major section will concentrate on the structural idea of bridging and the way in which relations between shallow appearances and deep universals might work in-discretely to abolish any absolute distinctions of level within the real. The next major section in this chapter will look more closely at the second aspect of the relation, that mediated by mentality, though it will place this within a much larger metaphysical frame which initially may seem to have little to do with mentality. To reiterate, the distinction between the sections is motivated by the previous analysis of in-discreteness which showed it to have implications for a static structural notion of spatiality, and also a dynamic processual notion of production.

Partially in-discrete analyses make qualified use of some features which reduce the influence of discreteness, but in a circumscribed way unrelated to the more general features of in-discreteness. A typical application is one in which an apparent duality is reconceived as a new form of unity in which the previously separated entities are dissolved or, more subtly, are found to coexist in mutual necessity. Within this mutuality the properties of the coexisting entities are found, in light of this new conception, to be understandable in terms of their necessary contribution to the new mutuality. One of these partially in-discrete features is the idea of animal-environment mutuality championed by James Gibson, which was intended to reform the understanding of perception by dissolving the traditionally clear-cut distinction between the perceiver and their environment. I will have more to say about ecological

psychology, and in particular the notion of invariance, but a less theoretically extreme position will serve for now to illustrate both the in-discrete nature of the mutuality in general, and the particular character of the theoretical issues which accompany attempts to rethink perceiver-environment relations. These theoretical issues will shed more light on the benefit offered by in-discreteness.

Animal-environment mutuality has been taken up in modified form by proponents of the "extended mind" thesis currently receiving attention in cognitive science, but in this formulation it is less a mutuality than an externalisation of computational functionality which was traditionally considered to be "mental". Andy Clark and David Chalmers[361] call this "active externalism" to emphasise the contrast with Putnam-style externalism of mental content, which they gloss as "passive" externalism[362]. Their arguments trade heavily on a direct embedding of mind-external artefacts and signs inside the expanded, resource-hungry "mind", and to that extent the proposed mechanisms appear to be in-discrete. Within the new mind-centred unity there is mutuality at a more than trivial level, as concrete acts are incorporated seamlessly into thought in a way that bypasses the traditional appeal to mental representations as purely formal carriers of transformed meaning. For example, a minimal mind extension that seems unobjectionable is using our fingers to count on to supplement our working memory. The act of calculating becomes more than purely mental, but while the roles played by fingers and mind are experienced separately, the contribution of the "external" component to the result cannot be separated from this larger understanding of "act". The fingers and mind are separate strands that contribute to a new in-discrete unity of calculation. More controversially, Clark and Chalmers offer the example of language itself in the form of brainstorming with or "bouncing ideas off" other people in order to develop concepts. The to-and-fro of developing ideas passing from mind to other person to mind is a nested in-discrete unity. A brainstorming session could be seen as a unity with several strands of conceptual development coexisting in near-chaos but from which a discernible unity gradually emerges.

The animal-environment distinction itself, regardless of its particular in-discrete credentials, has been a locus for many attempts to rethink perception in ways

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[361] See their "The extended mind" (1998, *Analysis, 58,* 7-19), the accepted origin of this development.
[362] This gloss understates the necessity for active engagement with the world in Putnam and, especially, Davidson.

that diminish that distinction. The success of these attempts depends on the way that mutuality is conceived, as some apparently obvious formulations fail to stand up to critical scrutiny, according to Daniel Palmer[363]. He notes that "mutuality" is easily interpreted as a mutually-exclusive duality or yin-yang-like co-dependency. In these circumstances a "morphological" conception of the mutuality relation in terms of co-dependent *structures* is the obvious instantiation, and the suggested demarcation between the structures tends to exactly follow the surface of the human body; the skin. The demarcation may be expressed in terms which emphasise connection, such as Egon Brunswick's description of the "mutual boundaries or surface areas" cited by Palmer[364], but the absolute distinction between the mutual entities nevertheless remains, though often well in the theoretical background. Hence what also remains, implicitly, is the foundational distinction between the inner (the organism) and the outer (the environment) which the idea of mutuality was supposed to overcome. This means that most studies of the organism, whether physiological or psychological, concentrate on its inner or "intradermal" nature, rather than its "extradermal" or trans-boundary nature. Ecological psychology has not escaped morphological thinking, says Palmer. He cites as an example Gibson's realisation that objects can change from environment to organism by becoming *attached to* a body, and contrasts this with an insight that objects may become *integrated with* or *assimilated by* the organism[365]. This contrast, though he doesn't say it, is between discrete and in-discrete ways of thinking about the organism-environment relation. On these grounds, the extended mind enthusiasts may be seen to be promoting nothing less than an extension of the limits of the mind, considered morphologically, to incorporate cognitive resources in an analogous fashion to the ingestion of food. Hence the mutuality they wish to suggest may be more akin to the in-discrete nature of digestion, directed largely by the organism's needs, than a truly mutual reconception of the inner-outer relation.

Bearing this in mind, one should be wary of attempts to create novel structures by simply throwing a new theoretical boundary around a collection of to-be-united entities. A more abstract form of morphological thinking, in which structural

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[363] Palmer (2004), "On the organism-environment distinction in psychology", *Behavior and Philosophy, 32*, 317-347.
[364] Brunswick (1957), in Palmer (2004), p.320.
[365] Palmer, p.343.

entities are replaced by variables related formally in an equation, may similarly result in thinking about the nature of the animal-environment relation going awry. David Morris, in his recent book "*The sense of space*"[366], criticises ecological psychology (particularly in the form developed by post-Gibson theorists such as Michael Turvey and Robert Shaw) for its reductive appeal to physics and its invocation of "basic and universal biophysical laws"[367] that can be conceived independently of their emergence through the interaction of body and environment. Morris' interest is in the nature of this emergence, which develops as the growing, maturing person moves and orients themselves in the world. His position is an extension of the phenomenology of Merleau-Ponty, and he joins that thinker in arguing against what they term the "ready-made world" view supposedly inspiring the thought of physicists and empiricist psychologists. While it is not entirely clear that Morris' critique hits its target, what is apparent is that whereas a morphological conception of mutuality can encourage a reduction to purely physical factors, an emergent phenomenological conception of mutuality encourages exactly the opposite, as it puts a very high value on interpreting the experience of the agent. Morris' central concept is "extra-ordinary depth", which respects the fundamental role our bodies play in organising the sense of space in experience, and this special sense of depth joins with the ordinary depth of the world in a "crossing" which combines body and world. He takes from Gibson's ecological psychology the idea that ordering (within the concrete environmental notion of space) emerges within movement, but asks, in relation to the tendency towards eliminating the agent's perspective from ecological relations, what does this ordering refer to?[368] The notion of crossing, by contrast, respects Merleau-Ponty's point that body and world are in a living tension[369], and Morris adopts that thinker's concept of "sens" to capture the way experienced depth changes in response to our living situation. This sense is "labile" rather than merely

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[366] SUNY, (2004).
[367] Morris (2004), p.15. See Turvey & Shaw's "Ecological foundations of cognition: II. Degrees of freedom and conserved quantities in animal-environment systems." **(**1999b, *Journal of Consciousness Studies, 6 (11-12)*, 111-23), whose preamble conveys their ambitious scope and its seemingly reductive implications, when they say "a conservation law is suggested that encompasses a psychology of transactional systems, a biology of self-actional systems, and a physics of interactional systems." (p.111)
[368] Morris (2004), p.13.
[369] Morris (2004), p.5.

changeable, in that the kinds of changes it undergoes are themselves subject to change[370].

Comment [BEW3]:

The preceding discussion does not pretend to provide an exhaustive survey of the forms that animal-environment mutuality can take. It does disclose, however, the extraordinary care with which that relationship must be explored in order to avoid simply re-inscribing some (though not necessarily all) aspects of the former duality back into the new theoretical picture, for instance by simply re-weighting the relative contribution of the components. For sceptics about ecological psychology, for example, placing a stronger emphasis on the perceiver-relativity of affordances than the objective nature of the environment can be the first step towards regarding ecological psychology as a form of idealism. That is, without a robust understanding of mutuality the relation between perceiver and world is seen as *ultimately* beholden to one or other of the "mutual" entities. A revisionist picture can be extraordinarily sensitive to the subtle nuances of a metaphysical understanding which may strive to straddle both sides of the to-be-revised relationship. Understanding how affordances can be both perceiver-relative and objective is a difficult task made more difficult if perceiver and environment are ultimately to remain separate entities, and it seems that certain styles of thinking about their relation will subtly encourage this. I suggest that a theoretical picture which utilises partially in-discrete analysis, such as looking at a single aspect of connection like animal-environment mutuality, can be expected to struggle if an attempt is made to subsume all problematic separations under that single in-discrete application.

The reason for this shortcoming is the presence of other in-discrete features that are not being addressed by the theoretical construct of mutuality. Mutuality is conceived as a mediating entity, something lying between that which it connects; in other words, there is a "space" which must be bridged and as a spatial construct it attempts, with varying degrees of success, to in-discretely connect two disparate substances. This is a slight exaggeration on my part, as the entities are not typically identified as substances, however inclining towards a morphological conception of mutuality results in maintaining an absolute separation between animal and environment at the limit, so that they are effectively different substances. It is unproblematic that the "difference" here truly is a difference in kind, but what makes the morphological notion

[370] Morris (2004), p.19.

of connection suspect is that the discontinuity between the kinds is concentrated into the special characteristics of the boundary between them rather than being spread over the entire relation. That which unites them also keeps them apart.

The anti-morphological connection here is nested, since the operative idea in mutuality is that no necessary boundary marks off the inside from the outside, yet there is a direction to the relation which unpacking the idea of "mutuality" discloses – there is a thickness to the nested relation which works in both directions, so that the bridging is both from inside to outside, and from outside to inside. Nesting leads from the less-inclusive to the more-inclusive; it leads continuously to ever-larger structures. From the inside it directs itself outward from the agent's centre of gravity (Kant's transcendental ego, or Wittgenstein's "extensionless point") onto the world; that is, from small to large, or from particular perspective to perspectival world. From the outside it directs from a particular piece of the perspective-independent world onto the general capabilities of a perspective-independent perceiver. The two must work together in nested cyclic continuity, and dynamically, as one piece of space succeeds another by incorporating it, yet the idea of mutuality can only inform the static, and hence incomplete, picture I have given. The way they must co-operate is through the agent fixing on some part of the world, as at the same time some part of the world calls itself to the agent's attention. In mutuality subjective and objective become inextricably intertwined rather than eliminated, but this is not yet apparent in this static picture of mutuality. The shortcoming cannot be addressed spatially, since what is lacking is not a product of the ordering of the entities, not even in a complex ordering such as this, but of their qualities, their natures – that which is contributed by the difference in kind characteristic of the inside and the outside. It is this dynamic, difference-centred relation that will be the subject of the next major section.

The most significant feature that cannot be addressed purely through spatial means is the issue of subjectivity. By subjectivity I do not mean to refer to the phenomenal *character* of experience, but the very *having* of experience itself; that is, the nature, rather than the specific phenomenal content, of subjectivity. This is not to say that subjectivity has no spatial characteristics, since clearly the distinction between "inner" and "outer" which motivates our folk-psychological commitment to a sense of self, and which I have already made use of, refers directly to spatial mutuality, while the idea of agency involves having a point-of-view, which is profoundly spatial. The

problem is precisely that each of these concepts, to the extent that it can be expressible in spatial terms at all, has too readily encouraged expression in a morphological structure of discreteness.

By remaining within the realm of the spatial no bridging concept can do more than establish the possibility of connection with a certain form between the agent's "centre of gravity" and the surrounding and enveloping medium. Accompanying commentary which invokes a quite different relation to the real is necessary, and it is this that Merleau-Ponty, for instance, supplies in the "Phenomenology of perception" when he emphasises dynamic and creative modes of relation in addition to the structure of spatiality which is implied by the breakdown of the mind-world duality[371]. David Morris' project, in "*The sense of space*" can be interpreted broadly as an attempt to invest phenomenal spatiality with an extra, non-ordered ingredient that somehow emerges out of spatialised interaction; a "crossing" of spaces, or a "fold" within spaces. This ingredient is conceived as a form of self-organisation, but Morris' suspicion of the tendency towards physical reduction shown by self-organisation theorists means that he thinks living organisms constitute a special class of organization which must be understood on its own terms. To the extent that his focus is actually on the phenomenal experience of such organisms, rather than the biological status of all living organisms generally, he evinces a tendency to erect a boundary between such organisms and the rest of the natural world, which is a move antithetical to the present project[372].

Spatiality therefore provides only one of the conditions for the possibility of subjectivity, and while it provides the structure of possible connection in the world it cannot provide the conditions of possibility for its content. It provides the "how", in the form of asymmetrically nested continuous connection, rather than the "what" of subjectivity. To put this point in a different way, it is not simply analytic that the new character of the mind-world relation emerges logically from the re-ordering of the old spatial relation. The character of that spatial bridge, its content, is a matter for a notion of production to address; for that which fills and replenishes and extends the structure.

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[371] The next major section will elaborate on these descriptions.

[372] Morris follows Merleau-Ponty in being suspicious of "physical laws". He argues "if self-organization is to be reduced to physical organization, if it does not constitute a new order that is to be understood in its own terms, through reference to itself, then is it really *self*-organization? If the organization of a system is to be explained in terms of laws fixed independently of that system, isn't its organization the product of something else?" (p.15).

This requires an appeal to overlapping-strands in-discreteness and their relation to the production of novelty. Now that the discussion of subjectivity has outlined the limitations of a spatialised understanding of connection, the nature of which the following major section will explore in more detail, some more positive implications of an ontology of relative depth and relative permanence can be pursued.

As I pointed out above, that which performs a bridging role is itself a spatial entity (bearing in mind that I am using "space" in the most general sense), and in this respect the concept of "information" is a useful illustration. Information is receiving a great deal of attention because of its apparent metaphysical neutrality – it is seen as a universal building block committed neither to materiality nor to mentality, and with strong relational credentials; or as Gregory Bateson put it, information is "a difference which makes a difference"[373], hence its early attraction for ecological psychology, which discovered the in-discrete potential of marrying an evolutionary story about information extraction abilities with a realist story about an information-saturated environment. Information is easily thought of as relational because it seems to implicate an amplification of pure difference, in that any difference in quality could in principle become a difference in kind – any difference, no matter how many decimal places are required to quantify it, can become a significant difference. However, the existence of difference as such is not the relevant thing, because the "made" difference which is information is always difference for something. Not only must the difference itself be registered to be "made", but that from which the difference is made, the ground from which it differentiates itself, must be registered also. Although relational connection suggests the possibility of an infinite number of degrees of difference, within which differing intensities have provisional status as effective beings, the critical thing with information is that both the difference which makes and that which it is made from must be *represented* in some way, as both transcend their purely relational status to attain a categorical existence. Information therefore becomes spatial just insofar as it consists of ordered, bounded representational entities – without bounds, informational representational entities will fail to correspond with the digitised stream of

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[373] Bateson (1973), *Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution and epistemology*. (St. Albans: Granada). Numerous related references. The earliest seems to be "A difference which makes a difference *is* an idea. It is a 'bit', a unit of information." (p.242, originally published 1969).

environmental input, so they must conform to the formal "ecological" requirement that symbols in such an environment be discrete[374]. Therefore information is structured in the same basic way that syntax is structured, and the fond hope of the new philosophy of information is the same fond hope that motivates the symbolic theory of mind; that meaning can be instantiated in purely formal structures which are in-principle separable from all other worldly commitments. Luciano Floridi, propounder of this new philosophy, wishes to recognise the historical-cultural move towards the "semanticisation of being" by committing himself to a philosophy strongly influenced by computation at its heart.[375].

The bridging ability of in-discrete connection has been the focus of attention to now. The discussion has revealed that nested in-discreteness is the condition of possibility for the form, though not the content, of connection invoked by such concepts as animal-environment mutuality. In this sense it is operating as a *proto-structural* concept, at a level below the actual structural relationship. This form of connection acts to homogenise the evident differences between entities which are otherwise structurally incommensurate. The entities so connected are in a sense forced into the same ontological level, that is, the quality that has been homogenised through their new relation is just that which made them different in the first place. This is the great benefit of spatialisation, diagnosed critically by Bergson[376], that it obliterates difference by reducing everything to various orders. Bergson directed his criticism at the way abstract spatialised thinking is the servant of technology and bureaucracy, and a hindrance to the understanding. This is not a problem for an in-discrete analysis, which Bergson himself goes on to demonstrate, because such an analysis reveals that order is not sufficient by itself, as the next major section will show. For a discrete analysis, however, ordering works in concert with the self-contained entities; it is higher-order information, as its differences make differences, as do their differences and so on, so ordering may seem sufficient to capture all possible relations, including semantic ones. Connection which respects difference, which is in fact constituted by difference, is not available (and is not

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[374] Ecological psychology talks of information "pickup" which happens in real time without the need for positing information-friendly representational entities. However, it could be argued that an affordance or invariance must necessarily be a discrete entity. The next section will look in passing at the meta-informational status of invariances, and reasons for considering their in-discrete status.

[375] Floridi (2002), "What is the philosophy of information?" *Metaphilosophy, 33 (1/2),* 123-45.

[376] See, for example, "Matter & memory", Ch.4. He is not opposed to spatiality in general, as Mullarkey

deemed necessary) on a discrete account. This sort of connection utilises overlapping-strands in-discreteness to blend relativities of abstraction (relative depth) and relativities of duration (relative permanence).

Relative depth

The dependence of one thing on other things is a brute fact in any account of reality that contains more than one thing. The view that "all things are connected" is not confined to process philosophies, but it is the way that things connect which differentiates metaphysical systems. This section will focus primarily on the kinds of things we call concepts, which fit a strictly causal view of relations quite poorly. There will be a brief discussion of ontological depth at the end of this section, but a fuller discussion of causal dependence and the "depth" relation will be deferred until the following section on relative determinism.

Dependencies between concepts are understood on the standard account as reflecting their positioning in a hierarchy created by decomposition of a master concept, or progressively creating new superordinate categories in order to accommodate anomalous new concepts. The "depth" in question refers directly to the hierarchy, in the form of relative vertical position, and metaphorically to the degree of abstraction, in the form of relative transparency in the realm of appearance[377]. The former has implications for epistemology (in the form of psychological instantiations of concepts), and the latter has implications for ontology (in the form of taxonomies and other forms of "carving nature at the joints"), while the distinction between universals and particulars cuts across both of these. Deep concepts are abstractions from shallow, everyday objects and events. In this sense the everyday objects would be said to "really" be instances of other things, those things being deeper, more general, more abstract, and more universal. Although there is a sense, not confined to Platonists, in which the deeper concept can be said to be immanent *in* the shallow ones, top-down abstraction results in disaggregation into conceptually distinct units of meaning because it is in the nature of abstraction that

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(1995) makes clear.

[377] Murphy & Lassaline (1997, "Hierarchical structure in concepts and the basic level of categorization", In Koen Lamberts & David Shanks (Eds.) *Knowledge, concepts, and categories* (pp.93-131), Cambridge, MA: MIT Press) present this contrast as between *pre-stored* and *computed* categorical structures (p.97), which reflects a computational influence on much modern psychological analysis of concepts.

overlaps between atomic concepts are rigorously purged of ambiguity to achieve a desired purity. Here the universals are at a considerable remove from their instantiations in the everyday, but they gain their epistemic credibility thanks to the mental effort required to discover them and to invoke them as justification for any particular applications. I will provide an in-discrete critique of an application of the standard view before offering an in-discrete alternative later in this section.

The cognitive scientists Eric Dietrich and Arthur Markman, whose definition of discreteness helped in my characterisation of both discreteness and continuity, have argued that mental representations must be discrete[378]. Part of their case rests on a strong distinction between sensory information and other representational content, inspired by a morphological conception of the relation between perceiver and environment. Sensory information is allowed to be, indeed must be, continuous, since this guarantees the right sort of nomic (law-like) coupling between world and sensory systems. All other representational content, which is internal to or passed between cognitive subsystems, must be discrete. Dietrich and Markman believe that the toughest hurdle for any counterargument for continuity to surmount is the self-evident requirement for "functional" connections between concepts. These functional connections depend on the ability of discrete concepts to be broken into discrete components and recombined in new ways. Their epitome of a concept rich in functional connections is that of a Worn-out Climbing Rope (WCR), and it is the functional connections within and between concepts such as this which cannot be modelled by anything other than discrete representations, they say. There is a lot of unpacking required to make sense of their claim – a claim that they avoid explicitly arguing for by appealing to the obvious richness and individuality of the WCR concept[379], and I will not attempt to provide this argument for them. However there are several features of their claim that refer directly to my counter-claim that in-discreteness provides the conceptual resources to more productively analyse the relations between concepts than either discreteness or continuity considered separately.

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[378] See their (2003), and a response in Parsell & Wilson (under review).

[379] And even this may be reading too much into their presentation of functional connections. It seems that we are to think of WCR as the content of a thought imbued with recollections of personal experience with a particular length of battered nylon rope, which thought also has elements of the abstracted qualities of all possible such ropes.

Discrete representations are a necessary part of a package of cognitive mechanisms which includes internalism and computation, where the internalism lies in the belief that all (or most) of the resources necessary to decompose a concept lie within the cognitive ecology of the agent. The correct characterisation of the WCR as a concept must be constrained by the semantic relations internal to concepts. But most such constraints are not the strongly analytic ones that Dietrich and Markman identify as "hierarchical" and include in their argument for discreteness[380]. They cite the categorization of the same object as station wagon, car and vehicle, and they note that typically it is the "middle" category that is privileged. They imply that the hierarchy is internal to a user of these concepts when they say "people's categories are organized into hierarchies"[381], but such hierarchies are analytic, therefore best regarded as logical and objective rather than purely personal. If concepts are indeed modally defined as Eleanor Rosch established, then constraints will more typically be defined in terms of other concepts, rather than in terms of a hierarchical relation to a master concept; and these connections, once again, cannot be wholly confined to the WCR user's own mind.

Connection with other concepts will therefore more typically be of the sort offered as definitions in a dictionary, where correctness is constituted by a set of "family resemblance" relations to other concepts that have been established through use in a language community. These relations are not reciprocal, so that significant aspects of WCR are dependent on the correct application of more foundational concepts. "Worn out", for instance, means "made useless by over-use" and also means "exhausted". It overlaps in meaning with "spent", which too means "exhausted". The agent thinking the WCR concept can therefore choose from a range of nuances (useless-overused-exhausted-spent), when expressing the concept, and the nature of this "range" is inadequately expressed by insisting that functional roles necessarily decompose into atomic concepts. The question is, what is the form of the connection implied by the ability to shift meaning in this way?

Comment [G4]: I'm not sure about this dictionary stuff. Is a new neural net that explains hierarchical concept categorization and the privileging of particular levels. Should I try a reply from this perspective? Would link closer to rest of our paper. I would prefer to keep this at the "concept" level. Have removed dictionary connections. What do you think?

I suggest that the correct way to think of the relations between concepts is that they overlap to greater or lesser degree, and an agent chooses "a" meaning that includes elements contributed by more than one constituent concept. Recall the

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[380] I discuss the discrete nature of hierarchies in section 2.2 Essence and disconnection
[381] (2003), p.111.

discussion of Davidson's radical interpreter communicating with their interlocutor, with both applying the principle of charity in their collaborative effort to be understood. On this strong externalist account the meaning of WCR will emerge as the parties progressively clarify each other's intentions (or, on an alternative account, as each applies with varying skill the linguistic conventions they are aware of[382]), and their shared understanding of WCR will range over the connected concepts and perhaps settle on an appropriate combination of nuances. On this account, the "bound" of an apparently discrete concept is not inviolable, being at least penetrated by other concepts, and to that extent is an exemplar of overlapping strands in-discreteness. It is not any ordering that provides the basis for the connection but a compositional relationship based on resemblance relations between non-atomic elements of each concept. The basis for resemblances will be highly variable – perhaps historical associations forged through habit, a common sound pattern, a shared connection with a popular culture icon etc.

It might be objected that while I have given an in-discrete reading of the way "worn out" may come to have a shared conceptual content, the primary focus of the atomic conception of a concept such as Worn-out Climbing Rope is the self-evident combination of the three components into one unitary WCR concept, and no amount of radical interpretation could ever arrive at this, in-discretely. The response to this depends upon how one understands concepts to be instantiated (or in a stronger sense applicable to computation, *implemented*), and a full discussion of this is beyond the scope of this project. Briefly, on a "bottom-up" view of concepts in-discrete connection minimises the separation between the components and emphasises their unity, while on a "top-down" view the only plausible mechanism is a concatenation of atomic elements. I will discuss these options below.

The "depth" appealed to by this disaggregation of the WCR concept into overlapping elements is perhaps minimal, as the elements themselves have very similar meanings; however it is worth bearing in mind that some implications of the concepts brought to bear on WCR may have "deeper" existential connections – a speaker of Australian or New Zealand English, for example, may use the old British dialect word "knackered" to refer to their old climbing rope, and this is associated with recycled horse flesh, the end of a productive career, and ultimately, with the possibility of death, which

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[382] Dummett (1991), p.116.

may not have such a remote association for a user of a climbing rope. Historically, some words are centuries older than others and have acquired more associations, potentially of greater complexity and richer elaboration – these are arguably more "deeply" embedded in their culture[383]. It is also unproblematic that one concept must depend on at least one other concept, otherwise learning a new concept by associating it with an already known concept would be impossible, so mere dependence is not strong evidence of a depth relation. However the depth which has become evident in the foregoing critique is not the hierarchical depth which results from decomposing the intelligibility of a concept, and it is not the sedimentary depth which results from cultural precedent. There is another way to think of how a "deep" concept might connect with those less deep – by being in some sense "basic" to the requirements of cognising creatures. This is a need that Kant filled with the pure concepts of the understanding, which he termed "categories" following Aristotle, because they fulfilled the same primary purpose of unifying the disparate elements of thought. Such concepts as unity, plurality and totality refer fundamentally to thought of quantity, while concepts of reality, negation and limitation refer fundamentally to thought of quality. The act of thinking requires the mutual involvement of raw sensation, its synthesis by the imagination, and the unification of both under one or more of the categories[384]. The combination of these is logical rather than structural.

A different way to think of this aspect of depth, which is influenced by Kant, is to see deep concepts as embedded in fundamental ecological aspects of the world such as movement, digestion, and dangerous objects. This would be to pay particular attention to the source of the foundational concepts and the method of their elaboration. From these foundational concepts other concepts achieve their meaning by extension, perhaps of the family resemblance kind. These ecological relations would be mediated by the self-conscious possession of a body, which would be the felt source of the metaphors that become the most basic components of all concepts[385]. To continue the climbing-

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[383] For example, "spent" became associated with "exhausted" many centuries before "worn out" and "exhausted" were linked.

[384] Kant, *Critique of pure reason*, (second edition, trans. Norman Kemp Smith). (London: Macmillan).A79/B105-A80/B106.

[385] See the work of Mark Johnson and George Lakoff: Lakoff & Johnson (*Philosophy in the flesh: The embodied mind and its challenge to western thought*, NY: Basic, 1999), Johnson (*The body in the mind: The bodily basis of meaning, imagination, and reason*, Chicago: University of Chicago, 1987), Lakoff (*Women, fire and dangerous things: What categories reveal about the mind*, Chicago: University of

rope illustration, it is the exhaustion of a worn-out *person* that provides an obvious source for applying the concept of "worn-out" to an old piece of sporting equipment.

This is a "bottom-up" view of the role of universals in conceptual creation, where these universal concepts are considered to be operating constructively within each of their elaborations; that is, they are immanent in less basic concepts. Peirce's theory of signs could be regarded as operating in this way. On the top-down view critiqued, the proper sense in which WCR is a functional unit is that it achieves this status thanks to the aggregating power of an individual mind belonging to the possessor of the life within which WCR came to have meaning. Hence conceptual in-discreteness is just a symptom of confusion (as will be the concept of in-discreteness itself!) I turn now to consider in more detail the in-discrete connection between concepts that is constitutive of the bottom-up view.

Mark Johnson describes his task epigrammatically as "putting the body back into the mind."[386] He notes that standard accounts of meaning depend on a separation between meaning-proper, which is conceptual, propositional, representational and intentional, and the background of pre-intentional and non-representational processes from which meaning-proper emerges. His aim is to elucidate the formative role that the background plays in meaning, using the concept of image-schema to break down that separation. The idea owes something to Kant's description of schemata as "procedures for constructing images"[387]. The image-schemas that he proposes as conceptually basic are not propositional because they are said to lack the "finitary" (or atomic and discrete) structure of propositions; by contrast, their analogue nature allows for the variety of transformations necessary to enable elaboration into more complex concepts. Transformations are cognitive operations such as scanning an image, tracing out probable trajectories of force, superimposing one schema on another, and contracting a multiplicity into a homogeneity[388], all of which would seem to have in-discrete implications. An example that speaks directly to my description of the problematic nature of discrete thinking will make this clearer.

Chicago, 1987). They align their work with the discipline of "cognitive semantics" (see Johnson, 1987, n.3, p.225), and later (1999, p.95) call it "embodied realism."

[386] Johnson (1987), p.xxxvi. This would seem to be the converse of the extended mind thesis discussed earlier.

[387] Quoted in Johnson (1987), p.21. The central role Kant accorded to 'imagination' is also of importance here.

Johnson considers the image-schemata based upon our pervasive bodily experiences of physical containment and boundedness[389]. We are aware of our bodies as three-dimensional containers into which we put things, and out of which things come. We experience containment in the form of clothing, housing and confinement; we move in and out of containers of various sizes and functions; we manipulate things that are themselves contained in other things; and all of these bodily actions refer to repeatable spatial and temporal organizations. In short, he says, the experiential basis for *in-out* orientation is that of spatial boundedness, and the most salient sense of boundedness is the experience of three-dimensional containment. Physical in-out orientation involves separation, differentiation, and enclosure, implying restriction and limitation. Some of the "entailments" (or consequences – the logical term is no accident) of the in-out image schemata are that containment typically involves protection from external forces; contained objects have a fixed location; and containment restricts forces within the container. George Lakoff has investigated the implications for emotional experience of this last entailment, that the body is a closed container: anger (an image-schema of energy, specifically heat in the form of liquid as boiling or steaming, or heat in the form of a solid as flaming) is trapped in the body-as-container ("filled" or "brimming" with anger) where it exerts pressure ('bursting" or "boiling" or "exploding" with anger)[390]. Clearly there is some intimate connection between the bodily experience, the image-schemata, and the elaborated metaphors and concepts. How could this work?

The image schemata are very general patterns that can serve as a constituent of an indefinite variety of experiences, perceptions and rich images, in the same sense as a "face" schema could consist of something like this ☺ - not a representation of *a* face, but the bare structure of all possible faces. As a pattern they are endlessly repeatable without loss of fidelity, like Whitehead's eternal objects, and yet they arise out of a developmental history of body-world-mind mutuality, in the way David Morris claims for "extra-ordinary depth". Typically they have a simple structure of parts and relations that allows flexible transformation in order to underpin and, critically, *connect* experiences. In this way they provide the basis for continuity of experience, in the form of overlapping strands of connective and generative tissue. This connection is both

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[388] Johnson (1987), p.3.
[389] Johnson (1987), pp.21-2.
[390] Lakoff (1987), p.383.

"horizontal" and "vertical"; that is, it speaks to the succession of experiences as well as their depth, but as my interest in this section lies in the latter I note the in-discreteness of the horizontal connection only in passing.

In spite of having the rudiments of internal structure, these basic patterns of representation are non-symbolic; they are in the realm of what Maxine Sheets-Johnstone has called "corporeal representation"[391]. They have a forcefulness that goes beyond being merely attractive to a detached, "noticing" cognitive function – she points out that Aristotle's offering of "suddenly" as a temporal expression linked to the quantifier "now", apparently of a piece with such terms as "lately", and "just now", is curiously different from its fellow terms. It is active, whereas they are passive; it is dynamic and qualitative, and borrows its semantic impact from felt experience[392]. In similar vein, Bergson points out that we must distinguish between two kinds of emotion, one of which conforms to the standard picture of emotions whereby an idea causes feelings, but gets nothing in return, so to speak; the other is, he says, a cause and not an effect, "it is pregnant with representations, not one of which is actually formed, but which it draws or might draw from its own substance by an organic development…the second kind of emotion can alone be productive of ideas.[393]" It is these sorts of intuitions that cognitive semantics shares, and which result in a bottom-up appreciation of the depth relation that is not only between concepts, but between a worldly body and creative thought.

The workings of the depth relation can be drawn out of Johnson and Lakoff's work only sketchily. It is consistent with holism as set out in an earlier chapter that any impediments to connection be no more than relative discontinuities rather than inviolable bounds, although that discussion did not detail much more than the existence of overlapping strands in-discreteness as evidenced by family-resemblance relations between concepts. Johnson develops the implications of the *in-out* orientation that grounds the family of image-schemata introduced above – very early in development these are projected onto inanimate objects (eg, squeezing out the toothpaste), but his

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[391] See Sheets-Johnstone (1999a), *The primacy of movement* (Amsterdam: John Benjamins).. It is beyond my scope to argue for this in detail, but one line of argument would be that the internal structure of image-schemata is not available for decomposition into raw components; it is their mutually-necessary combination that plays a causal role, not the sum of their syntactic elements.

[392] Sheets-Johnstone (1999b), "Emotion and movement: A beginning empirical-phenomenological analysis of their relationship." *Journal of Consciousness Studies, 6, (11-12),* 259-77, p.259. The Aristotle reference is to *Physics*, 222b27-9.

[393] Bergson (1935), pp.35,36.

interest is primarily in the way metaphors extend a schema from the physical to the nonphysical. Note the use of topological terminology such as *project* and *extend*, though one thing that occurs during extension is elaboration, which is not so clearly topological. Part of this process is the stripping away of physical and spatial character, but this is barely evident in the most basic form of the *out* schema, which in turn embodies the more fundamental schemata, *Containment + Leaving*; for example, in physical form the basic *out* manifests in a sentence like "Squeeze *out* some toothpaste", while in more abstract form it appears in the sentence "Tell me the story again, but leave *out* some details."[394]

Johnson suggests that what does the extending, projecting and elaborating is not a separate process; instead, the in-discrete mechanism is experience itself. That is, all the functionality necessary lies within the nature of image-schemata as active, continuous patterns of self-world interaction. Just as the body itself serves as the basis for the containment component, so too does our bodily experience of intentional movement provide us with the basis for directing our point-of-view into or out of particular places. Although a form of nesting is operating in the way one schema works within another, more diverse forms of connection are hinted at here. Imagination works to project or extend image-schemata from one domain to others, and these actions suggest overlapping-strands in-discreteness, but detail of the process internal to such projection is vague. Perhaps some clues can be found in earlier work not apparently influential on cognitive semantics.

A precursor to cognitive semantics lies in the work of Lev Vygotsky, who argued that thought and word have separate origins in early child development, but quickly become inextricably intertwined. His idea that the proper unit of analysis was word meaning, in which all the properties of language can be found in simple form, parallels Johnson and Lakoff's findings. Among Vygotsky's challenges to the dominant theories of language development[395] were that word meanings change throughout child development as well as historically as a culture changes, and the primary mechanism of connection between thought and word is not association[396]. Both challenges leave the way open for complex relations within the development of meaning, and it is interesting

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[394] From Johnson (1987), pp.32-4.
[395] c.1930s, primarily Piaget and behaviourism.
[396] Vygotsky (1962), *Thought and language*, (Cambridge, MA; MIT Press). pp.120-2.

that Vygotsky criticises Gestalt psychology for its over-emphasis on structure (and therefore, as he sees it, an over-reliance on analogy) as a determining principle, whereas Johnson draws support for the idea of the transformative powers of internal structure from the notion of gestalt as a process of completion and unification[397].

In spite of this apparent difference, they share an essential point – Vygotsky believes that every thought is a generalisation[398]. This requires a dynamic and in-discrete cyclic process where thought and word influence each other in turn, as separate-but-distinct elements of a complex, rather than homogeneous, unity. Vygotsky points out that the standard division between semantic and formal phonetic elements of speech leads us to think that syntax, the formal part, determines correct meaning, but this is routinely violated in practice and is found in its pure form only in mathematical formalism. He says "Our daily speech continually fluctuates between the ideals of mathematical and of imaginative harmony."[399] However while Vygotsky's work lends some historical weight to the intuitions driving the study of embodied semantics, it does not provide us with many further clues as to the nature of the in-discrete connections hinted at[400]. Can we find a description of the in-discrete depth relation in Johnson and Lakoff's work which adds to this?

Johnson (1987) certainly has the depth relation as his target when he develops his story using a second basic experiential component, that of force, as he says "I want to explore the way in which patterns of typical experiences of force *work their way up into* our system of meaning and into the structure of our expression and communication."[401] Within experience, force manifests in a number of simple but separable ways; for example it always involves interaction, some directionality, and a source/target distinction. These elements and others constitute gestalt structures (the

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[397] Kanizsa (1979, *Organization in vision: Essays on gestalt perception*, New York: Praeger, p.56) points out that "gestalt" translates best as "coming to organization" rather than simply as "form". Hence Johnson's use seems more inclusive and less dominated by the notion of structure.
[398] Vygotsky (1962), p.124. Though he mentions metaphor only in passing (for example, p.73)
[399] Vygotsky (1962),pPp.127-8.
[400] I do not mean to suggest that I have exhausted all such sources, as there is a large and growing body of work in linguistics. See the topic-oriented list of references in Lakoff & Johnson, 1999. Linguist Anna Wierzbicka (see her *Cross-cultural pragmatics: The semantics of human interaction*, New York: Mouton de Gruyter, 2003) has introduced the idea of a Natural Semantic Metalanguage, in which basic words owe their meaning to natural-world and bodily attributes, and from which important cultural differences can be explained. There appears to be little overlap between her work and that of Lakoff & Johnson's exploration of metaphor. My interest is in the nature of the process offered as explanation for the depth relation.
[401] Johnson (1987), p.42. Emphasis added.

image-schemata), in the sense that their structure is an emergent property of experience. One force schema, for example, is *compulsion*; the experience of being moved by external forces. The simplicity and immediacy of these abstractions from experience is an argument for their plausibility. The compulsion image-schema is not just a background from which meaning emerges, *somehow* it is itself a meaning structure. An essential element of the meaning of compulsive force is modality; the extent to which we must, may or can be compelled, and this feeling is part of our experience of compulsion. Johnson uses the work of Eve Sweetser at this point, and quotes her conclusion that modal meanings are extended from the causal world to the epistemic domain precisely because we generally use the language of the external world to apply to the mental world, which in turn becomes structured in parallel to the external world.

The standard view is that physical modality (eg "You *must* move your foot or the car will crush it.") and epistemic modality (eg "You *must* be hungry, I know it's hours since you ate.") are independent in the way that causality and logic are said to be independent[402]. Johnson claims that argument structure itself is an image-schema that combines compulsion with path-following to a destination, hence the commonality between the physical and epistemic domains[403]. In combination with Sweetser's conclusion that structures borrowed from the external world are appropriated for the internal world, we can now reconstruct an overview of the world-to-thought metaphorical process. In order of conceptual priority: First, preconceptual experience reveals to us regular structures in our bodily interaction with the world. Second, things we do in the world, preconceptually, become incorporated into developing image-schemata. Third, some image-schemata become particularly associated with the act of thinking, which in turn is used to justify or argue for states of affairs in the world. Fourth, all image-schemata are available for imaginative transformation to create mappings between current states and projected future or counterfactual states. The transformations depend upon the minimal internal structure of the image-schemata being available for differential transformations, and the critical structural relations retain some sort of invariance under transformation. It is this last step that has been difficult to isolate from Johnson's work.

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[402] Johnson (1987), Pp.48-51. The Sweetser citation ("in press" at the time) is to *From Etymology to Pragmatics: Metaphorical and cultural aspects of semantic structure* (1990).
[403] Johnson (1987), p.54.

The tension between an ecological reading of the *mutuality* that informs metaphor, and an irreducibly psychological reading that makes cognition the *glue* for all the structural analyses outlined above, is most apparent when the image-schemata for "balance" are applied to the interpretation of aesthetics, in the form of works of art. The viewer must resist the obvious, that the apparent balance in an artwork is a characteristic of the figures depicted, *were they to be physically instantiated in the world*. No, says Johnson, "the balance here is *visual*, it is not a balance of actual physical weights or masses in the bronze figure. It is a balance of line and of visual forces that can create perceptual motion in an apparently static figure."[404] He goes on to insist that "the relevant balance of colour forces [in a Kandinsky painting] exists only in our act of perception, as we encounter the painting", and further, "we are dealing here with psychological patterns or schemata that make it possible for us to have structured, coherent experiences that we can make sense of. We are dealing with levels of organization that are on the borderline between bodily processes and conscious or reflective acts that we can focus our attention on, if we choose."[405] This is not the place to enter into an analysis of imagination, but it is relevant to wonder why a project grounded in body-world interaction should ultimately pay so much more attention to internal, personal factors than to the nature of that "borderline"[406]. It seems that Johnson takes seriously Kant's development of the Aristotelian notion that imagination mediates between sensory experience and conceptual thought, though he wishes to convert all the Kantian dichotomies into continua. Imagination occupies all the middle ground excepting only the extreme poles (for example, those of reason opposing sensibility), and this is as far as the "borderline" idea is taken. Even in the later work (Lakoff and Johnson, 1999), the in-discrete connection which is entailed in the borderline notion of something with characteristics common to both sides of the "border" is left to the presumed in-discrete characteristics of neural nets, and is not spelled out in detail.

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[404] Johnson (1987), p.82. Emphasis in the original. He seems to have in mind a contrast with the apparent balance of the two-dimensional representation as a flat image, when he stresses later (p.99, emphasis in the original) that "The balance was not objectively *in* the visual configuration, as a mere set of marks…"

[405] Johnson (1987), p.85.

[406] In this regard, note that Perceptual Activity theory has been applied to the production of imagery (see Nigel Thomas (1999), "Are theories of imagery theories of imagination? An active perception approach to conscious mental content.", *Cognitive Science, 23*, 207-245). The idea of schemata in use here is that of stored procedures for environmental scanning and testing. Imagery results when the tests are performed off-line, as it were. The representational content of the schemata, although minimal in Johnson's work, is downplayed still further in PA theory.

Now it would be too swift, and intellectually dishonest, to regard Johnson's work solely as another attempt to subjectivise the world in the guise of a respect for embodiment[407]. But Johnson, as does David Morris, finds relevant structure only in the complex interweaving of (human) body-world and mind, and to the extent that it necessarily emerges from the mutual interaction of the two, it cannot be said to owe anything to the world outside the (human) body-mind. While the present project is in no way concerned with reducing one to the other, it is concerned with elucidating proto-structural principles that are more general than, and hence owe nothing to, either one or the other. Therefore rather than being an independence which reflects an objectivity free of any possible viewpoint, the desired independence reflects an objectivity available to all possible viewpoints. These are the principles of in-discreteness, which are, as the first section of this chapter disclosed, proto-structural concepts. A suggestive line of enquiry does exist within Johnson's work. When discussing early, relatively unformed views on the role of imagination, he quotes the poet Coleridge, who says that imagination modifies an image "by a sort of fusion to force many into one." Artistic, or secondary imagination "dissolves, diffuses, dissipates, in order to recreate…it struggles to idealise and to unify. It is essentially vital."[408] Johnson's own explanation for embodied metaphor never returns to this richly in-discrete ecology of non-morphological relations. By his own lights these descriptions of imagination cannot be dismissed as "mere" metaphor.

Unlike Johnson, I am not concerned with providing an account of the "specific nature" of metaphorical projection, only to bring out some relevant but general structural features that enable such projection. These features are, on my account, not at all specific to metaphor. The presence of parts, for instance, which have some mutability relative to each other, will result in the extension of a basic image-schema being unmarked by absolute start and end points as the parts contribute to the developing metaphors in varying ways. That is, the "start" will lie in the nature of an event, an entity which typically has no boundary conditions, within which one or some features can be associated with an image-schema, and it may prove impossible to identify a determinate point at which "the" schema becomes operative. Introspectively it does seem plausible

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[407] See Mullarkey (1994, "Duplicity in the flesh: Bergson and current philosophy of the body.", *Philosophy Today, 38, 4,* 339-55) for a brief survey of recent "embodiment" talk.
[408] Johnson (1987), pp.68-9.

that there is a moment, perhaps of an "a ha" nature, beyond which it is possible to say of one's own thought that "the idea just occurred to me". But to take this seriously as an indicator of discreteness would be a mistake, since it would privilege the "noticing" role of consciousness over the preconceptual processing which is said, by its proponents, to be the proper mechanism of elaborated metaphor. One or more image-schemata may be associable with the structural element(s) found within the current context, and since there is no conscious selection said to take place, the use of any one of them to generate productive entailments could be regarded as being in conflict with the others – there may be substitution, as first one elaborated metaphor then others are tried for their "fit" with the context, in a halting, fragmented way; there may be error, as an inappropriate metaphor is applied; and there may even be vacillation, as metaphor cycles between competing but equivalent entailments. These in-discrete features are all found in neural nets, as discussed earlier.

The elements of the elaborated metaphor are overlapping strands that allow the user of the new image to tailor its strength to suit the application, in the same sort of way that communication about the Worn-out Climbing Rope can be more or less nuanced by the component mix of "exhausted", "spent" and less-related implications. A more metaphorical example is given by Lakoff and Johnson, who argue that the complex metaphor "A Purposeful Life is a Journey" gains its experiential grounding from its two primary metaphors, "Purposes Are Destinations", and "Actions Are Motions"[409]. This means that the experiential heart of the resulting thoughts, consisting of the primary metaphors, is operating more-or-less continuously during their genesis and expression, but the strength of their relative contributions could vary dramatically depending on the circumstances. In an event marked by discussion or information exchange the obvious possibility of the parties trading incompatible metaphors arises, where only a subset of the basic metaphors may become the basis for responding, and communication is led astray by the imaginative ramification of some structural elements at the expense of others – here communication would struggle to stay "on message", as it were.

In addition to considering the part-whole relation within metaphor, there must be a continuous connection between the "start" and the "end" of an elaborated metaphor which respects the unity of the image-schema as a whole, irrespective of the

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[409] Lakoff & Johnson (1999), pp.60-3.

internal mix of elements – this is the spatial aspect of the bridging which must occur between disparate entities. The very idea of a "mapping" from one domain to another, which gives metaphor its constructive power in thought, is one of nested in-discreteness. The various transformations Johnson lists, including superimposing, fusing a multiplicity into a homogeneity, and "diffusing, dissolving , dissipating" (from Coleridge) must all operate continuously in the sense that, like any analogue quality, they can in principle terminate anywhere and, within the range of complexity they can conceivably take, can exhibit any level of complexity. Although it is difficult to imagine the phenomenology of a "one-third-elaborated" complex metaphor, it is certainly possible to recall occasions where metaphor was "weak" or inadequate. The discrete alternative would have some favoured discontinuities or thresholds, before which metaphor was assuredly and objectively "weak" and after which it was just as objectively "strong". If the source and target domains are defined as bounded categories then the mapping would be performed by a function, having the form of an algorithm operating syntactically on discrete elements. This would lend to preconceptual thought the character of a jump or leap, which would result in the intervening "space" being regarded as having no constitutive role and no character of its own, except to separate the domains. The gappiness of this sort of connection is discrete rather than in-discrete. If the in-discreteness of the source domain is considered in the way described in the previous paragraph, this option has limited plausibility. This is not to deny that certain target domains may assume cultural dominance, or that certain elaborated metaphors achieve prominence and become "basins of attraction" towards which thought tends to gravitate; however the existence of fashion and clichés is no argument for discreteness.

The discussion to this point has been focussed on illuminating the in-discrete nature of conceptual depth. Is there a parallel analysis for ontological depth? Ontological depth is another way of describing proper part-whole relations, where the parts contribute causally to the functioning of the whole as well as participating in causal relations with other parts – these sorts of relations tend to be the subject matter of scientific investigation and engineering implementation, and are a pervasive feature of everyday life. A typical example of ontological depth is the relationship in chemistry between the entities atom-molecule-compound, while a more everyday example is electric current-picture tube-television set. These form an ontological hierarchy, where the depth may be formally described in terms of *levels* of analysis, if the objects at each

level have a particularly characteristic manner of relations. This allows a necessary, though perhaps not sufficient, explanation for the operation of the whole while remaining within the causal relations of that level, utilizing the concepts associated with each object. There may be an entire scientific specialization devoted to one level of explanation. The atom-molecule-compound hierarchy supports several levels of description, while the electric current-picture tube-television set progression maps onto explanatory relations between concepts rather poorly. Disputes about the sufficiency of the levels of explanation then typically follow, and the standard scientific practice of reduction has been to attempt to understand the phenomenon at the lowest level of explanation possible. This is clearly an enormous topic, which I wish to touch on without deeply engaging with. I shall start by pointing out that there is considerable pragmatic and philosophical pressure to regard all concepts that participate in explanation as discrete, which is why I avoided discussing this sort of depth when considering conceptual depth – they are rigorously purged of overlapping connections with other concepts in order to be as distinct as possible.

The matter of the best characterisation of the ontological entities themselves, and their interaction in part-whole *causal* relations still remains, however. Here too there are strong tendencies towards discreteness, both in relation to the nature of the objects and to the understanding of what "levels" consist in. One place to start is with the notion of "size", though this is an unpromising way to present it. Consider what a "big" concept might be like – it can be profitably used in the explanations of a large number and wide range of phenomena; it is a necessary antecedent of many concepts that themselves have explanatory power; and it lies in the historical and cultural past of many concepts that have current explanatory power. Of course the judgement that such a concept is "big" is rather folk-philosophical, but the implication is clear, that some concepts have more leverage on the world than others. There might be general agreement, taken without reference to any particular context, that "freedom" is a big concept, as is "will", and so is a type concept such as "electron", though perhaps "planet" is a small concept. When the context in which a concept does its work is considered, the impact or contribution will be dependent on other concepts; hence "will" may be a minor player in an explanation of political freedom but a more significant contributor to an account of mental causation. The fact that it may not be the very same concept in use in both places, that the rigorous purgings of ambiguity I referred to above have operated differently, but successfully,

within different domains of explanation, is a testimony to the relational nature of the conceptual environment each performs its work in.

Now consider a version of this scenario that replaces a concept with a thing, something that is actual. Without presupposing too much about philosophical views of causation, it is safe to say for folk-physical and even for scientific use, that actual things have causal influence, so it is natural to suppose that a "big" thing will have a lot of causal influence – in keeping with the criteria listed above, it will create a large number and wide variety of phenomena; it is a necessary antecedent of many things which themselves have significant causal powers; and it lies in the causal past of many things which have significant current causal powers. An electron is not a big thing, neither is a tree, but a planet is, and a solar system even more so. A cloud is not big, though a cyclone is. Describing a concept as big is a metaphorical extension of the image-schema "A Thought Is An Object" (which rationalists take literally), but big causal objects do indeed tend to be just big objects. However in parallel with the picture of conceptual influence I outlined above, objects and processes achieve their causal influence in relation to other objects, and "size" may result from two factors not available to concepts: simple aggregation (one electron does not electrocute but electric current does), and emergence of new structures (one cloud may be a squall but a cyclone is more than just a lot of cloud). For many people reductive explanation results in a view that objects such as solar systems and cyclones are not objects at all, and their objecthood is itself just a convenient metaphor. The question of ontological depth, and the greater causal powers of some objects, is a question that can be reframed as a question about the nature of in-discrete determinism. I will take this up in more detail in the next major section.

This section has investigated one aspect of the relativity that is native to in-discreteness, that of relative dependence/influence as it manifests as conceptual depth. Another aspect is the durability of beings, their resistance to change that manifests as relative permanence. One of the distinctive markers of process philosophy is the important role played by flux and change, which nevertheless must be compensated for by stabilising mechanisms (pragmatic for Bergson and Dewey, and metaphysical for Whitehead) – and it is typical of empiricist and idealist philosophies in the west, and of Buddhist philosophies, that permanence and radical impermanence are forced to coexist

uneasily. Such a forced distinction is seen as unproductive, however, on an in-discrete analysis.

Relative permanence

The previous section discussed the cognitive semantics notion of an image-schema, the nature of which can best be described as a pattern of relations. What comes with the concept of pattern are the related notions of structure and persistence – unpacking the idea of pattern, it has some relatively invariant internal relations, and it has sufficient persistence that its existence matters to something else. In fulfilling the minimal requirements for objecthood it also fulfils Bateson's definition of information, of a difference which makes a difference[410]. That section looked particularly at an in-discrete understanding of pattern and how it can be mapped from one domain to another, which required paying some attention to the implications of structure, but it had to take the persistence of the pattern for granted. This seems to be the right way to think of persistence, as just the outcome of other factors, and therefore as the product of an ecology of interrelated and interdependent forces.

A discrete understanding of entities as bounded and complete will encourage the positing of an essential factor that maintains that completeness. Spinoza had the right idea in talking of the simplest bodies being distinguished from each other solely in respect of motion and rest; their activity, or "energy" as Hampshire glosses it[411]. More complex bodies are compounds of simpler bodies and therefore are similarly the net product of constructive and destructive forces "so that their mutual movements should preserve among themselves a certain fixed relation."[412] Inasmuch as self-destruction is necessarily foreign to anything (otherwise it would already have destroyed itself), things can be said to endeavour to persist – Deleuze adopts the formulation given for human beings and generalises this as "a capacity to be affected", while Whitehead gives it a positive nature and calls it "feeling". In all three formulations this capacity is stronger, or at least more evident, as the being is more complex[413]. However there is a critical difference between the Spinoza and Whitehead interpretations; for Spinoza the universe

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[410] See n.373
[411] *Ethics* II, P13, L1; Hampshire (1951) *Spinoza*. (Harmondsworth: Penguin), p.71.
[412] *Ethics* II, P13, Def.
[413] *Ethics* III, P6; Deleuze (1988b), p.99; Hampshire, p.78.

is a closed mechanical system where energy is conserved, while for Whitehead the universe is open and organic. In the organic philosophy persistence in being is intimately related to the novelty in continuous creation, which as the previous chapter showed is expressed as an in-discrete process of pattern transmission from one epoch to the next.

Persistence as such is not, then, the real issue. What is interesting are the implications of an in-discrete understanding of relative permanence. This can be illustrated by considering a question prompted by the previous discussion of the relative conceptual depth that is promoted by image-schemata. What might stimulate the transition from one image schema to another? Something in the world, or something in the agent? This kind of forced choice seems artificial, and for good reason – even without a metaphysic which blurs the distinction between the two, cyclic interaction between them would render the question meaningless, in the same way as the question of the temporal priority of the chicken over the egg is meaningless. The only appropriate answer to "which comes first?" is, "that is an inappropriate question". The generality and flexibility of image schemata allows them to be modified to fit many similar, but different, situations that manifest a recurring underlying structure[414]. Transitions occur in real time, as the agent moves through their environment encountering objects and participating in events. Although Lakoff and Johnson define embodied metaphor as responsive to the body's engagement with the world, the nature of image-schemata is ultimately to be internal patterns of neural relations since the primary focus of engagement with the world lies in the experience of an embodied person[415]. On their account the body mediates between the mind and the world, although they strenuously attempt to assimilate many of the traditionally "mental" functions to the body. They do not consider the possibility, not even to reject it, that image-schemata may be responsive to "recurring underlying structure" in the environment.

The opening section of this chapter looked at the subtleties attending the concept of animal-environment mutuality as a way of explaining the positive contribution in-discreteness can bring to disputes about connection. There is no question that Lakoff and Johnson and other cognitive semanticists think that they are explaining an important form that this mutuality can take. They are reacting against a fully-

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[414] Johnson (1987), p.30.
[415] See the concluding chapter in their (1999).

internalised cognitivism that at its limit becomes an idealism in which the environment is just a projection of the mind. The significant subtlety that blocks their form of explanation from achieving a genuinely ecological dimension is just this: How to conceive of an environment as objectively available to all relevant perceivers, and also as uniquely embodied in a particular human being? The mutuality they endorse is a modified Kantian model where the elements are mutually necessary, yet crucially in their mutuality are different from the elements as found in the source domains. On their model elements sourced from the human domain dominate the elements sourced from the environment, within that mutuality. In fact much of the "environment" domain just is the product of human interaction in the form of other people, artefacts, and the impact of the agent's actions. This contrasts with the kind of environment-dominant explanation David Morris finds in modern ecological psychology, which looks as though it seeks to reduce everything to the physical.

There is a middle ground where mutuality is of the cyclic and iterative kind that reduces the chicken-and-egg problem to irrelevance, and this is in fact the mutuality that ecological psychology claims for itself. There are two levels to this form of explanation that reflect the differing emphases on evolution itself and the environment: First, the conditions of possibility for mutuality lie in the evolutionary heritage of organisms, such that they have been shaped by the environment, and they in turn have exerted some influence on it. Although influence is mutual, the environment dominates at this level. *Evolutionary* psychology (which is not at all closely related to ecological psychology) takes this relation as basic, and although it acknowledges significant cultural modification of the environment, it claims that human-generated modifications are of such recency that they can have had almost no impact on long-standing evolutionary developments in human cognition[416]. Ecological psychology, on the other hand, claims that comparatively recent cultural intervention in the environment has operated at a macro-level that leaves the affordances of the environment largely unaffected. It too takes this level of historical mutual relation for granted. In relation to

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[416] David Buss (1999), in *Evolutionary psychology: The new science of the mind*, (Boston: Allyn & Bacon), p.22, gives a brief statement of the scope of evolutionary psychology which highlights the banality of the problems it believes cognition is directed to addressing: "Humans are collections of mechanisms, each one of which was forged over evolutionary time by the process of selection. The products of this process tend to be problem specific – keep warm, avoid predators, get food, find a mate, have sex, socialize children, help kin in need, and so on."

the second level of mutuality, the conditions of possibility for each act of perception lie in the respective characteristics of animals and environments; the process of perception is a mutuality of need and resource. This micro-mutuality will be a focus of this section, where the patterns that emerge within embodied cognition are found to be related to the relative invariances of the environment.

There is an unbroken continuity connecting me to the horizon. To start, I push my head as far as I can into my chest. There I am, just beyond my upper lip, in focus. Now I look up, slowly. My shirt, my trousers, my feet all come into view in order, each behind the other. My trousers overlap my feet, my feet overlap the ground, the ground laps around some trees and overlaps the school playing field, which lies behind and below the trees. The field merges with the school buildings, which overlay the river, above which are the distant hills. Here is the horizon, followed by the sky. One path with no gaps leads from my upper lip to the sky, but it is not a smooth path; there are discontinuities at the overlaps, where the surfaces meet. This is the visual world described in terminology borrowed from ecological psychology. There is no part of it which is free of detail and therefore empty. If I take a couple of paces forward and to the side, the scene changes slightly close to me, but in the distance it changes not at all. This move reveals that space, the ambience around me, is also full of detail, though how it seems right now depends on which way I face, and on the distance of my eyes from the ground. Wherever my head is, there will be a scene to take in. Space is full of structure, and the sort of structure that connects me to the sky in overlapping continuity is that of nested in-discreteness. In this case the nested structure is tied directly to my point of view – it reveals a path from me, a Me-To-There path that always has me as its source.

This is a path which is a condition of possibility for the engagement of any visual system whatever with the environment, not just an adult human one. Potential alternative configurations are highly implausible – one such that could deny the dynamic bridging explicit in my account would be a direct, gappy, “space-crossing” connection that enabled a leap from the right sort of object (understood as a distal structure which serves the perceiving agent’s interests) to the right sort of external visual receptor at exactly the right time. If invoking an amazing temporal coincidence of interest and satisfaction seems a little strong, perhaps a telecommunications model of call-and-response would work, in which the agent “calls” an object over an intervening and featureless space, with the object then “responding” with visual stimulation. This truly

would be not only a ready-made world, but also a serendipitous best-of-all-possible perceptual relations world. The only possible relation for all possible visual experiences is a progressive, difference-by-degrees spatial bridge which evolves in real time dependent on the agent's movement, and which connects a structural, but not *yet* phenomenal, core to ever-enlarging fields of possibility.

The structures that are available to perceptual systems are not necessarily objects as we conventionally know them. When I peer through the trees at the distant horizon what I see are vertical bars of dark on a light background. That structured appearance provides "pre-objectual" information about foreground and background irrespective of the identity of the objects or even of their status *as* objects. The dark bars, after all, may be connected in the form of a screen. A brief flick of the eyes and their refocussing on those bars, however, immediately changes the quality of the appearance – now I see slender young trees with uniform dark bark, and I see by concentrating on their narrow leaves that they are acacias, and what is more, around the tips of the twigs, barely visible as I peer more ferociously through the gloom, are pale yellow flowers. This space is not only full of a structure centred on me, but by moving, focussing, concentrating, I can find more and more structure. This too is nested, in a fractal sense, since each pragmatically-motivated stopping point in my interrogation of the scene reveals more structure, without any presentiment that at some lower level of interrogation the structure will cease – I am invited, if you like, to keep on delving deeper and deeper into the scene to the limit of my perceptual systems, as the promise of being able to extract more and more from the scene shows no sign of being unfulfilled.

Here is one way in which in-discreteness is a condition of possibility for perception, by being the stuff of the background in which appearance gains its relevance to me, but in such a way that it is a relevance provisionally available to all possible creatures with similar perceptual systems. It is not god-like detached objectivity free of all possible perspectives which is on offer, but embedded objectivity available for assimilation to all possible subjectivities, and its embeddedness is, by its nature, nested and centred. This means that a description of what the objects in the world I perceive *are* cannot be entirely separated from a description of what the objects *mean* to me. It suggests as well that, in terms of a continuity of connection between the perceiver and the world, there might be connection between the conditions of possibility for perception

and the conditions of possibility for higher-order transformation of perception. In other words, there may be some proto-structural commonalities between thought and world.

Earlier in this chapter I used Daniel Palmer's notion of a morphological relation to look at formulations of mutuality that retain important structural separations between animals and environments, and I reported his use of ecological psychology to illustrate how, in spite of its best efforts, it had apparently not fully transcended the limitations of such morphological thinking. James Gibson's early idea of mutuality has been extended by Michael Turvey and Robert Shaw, who like Palmer use Dewey and Bentley's distinction between dualist styles of explanation and *transactional*, non-mechanical explanation. The idea of a transaction is a pragmatic one, marked by mutual concessions and interdependence. They point out that "taken together, an animal and its environment may be mutual and reciprocal, symmetric and asymmetric, but at a higher level they are complementary duals. They combine to make a whole, namely, an (epistemic) ecosystem." Hence the asymmetry of dualism must give way to a symmetry of duality.[417] Broadly speaking, this means that a property in each system plays the same relative role in each system – more formally, they say that for any relation r_1 in System 1 there exists a relation r_2 in System 2 such that there is a symmetry T, where $T(r_1) \rightarrow r_2$ and $T(r_2) \rightarrow r_1$. Although this looks superficially as if a kind of mutual interpenetration is being proposed, it is actually much weaker and depicts little more than a shared relation, or coupling.[418]

Comment [BEW5]:

The coupling at issue here is one which, in spite of the central role accorded to mutuality, is largely driven by the environment. This is not to deny the nature of the mutuality on offer, as Palmer almost does by gesturing at its failure to break free of morphological thinking, but rather to appreciate that the mutuality has a full-blown structural character that is lying in wait for an appropriate user. An affordance is the specific capacity of the environment *defined with reference to* an animal – or, as a listener might respond to the words of the song, "If you want it, here it is come and get

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[417] Turvey & Shaw (1999a), "Ecological foundations of cognition: I. Symmetry and specificity of animal-environment systems.", *Journal of Consciousness Studies, 6 (11-12)*, 95-110, pp.98-9. Their reference to Dewey & Bentley is to *Knowing and the known* (1949). The transactional concept is ascribed to Einstein & Infeld, *The evolution of physics* (1938).

[418] Turvey & Shaw (1999a), pp.99-100. The "any" modal operator is ambiguous, as it may mean "all". Charity suggests that the authors mean "at least one".

it…"[419] The significant problem with a structural account is that it leads to a search for the matching structure within the animal, or as Turvey and Shaw put it, "identifying the duality symmetry that relates animal and environment will be a major scientific challenge." This will inevitably reopen the door to a theory of representation, since this just is the idea that structures within the cognising creature are related to structures in the world; this is as true in the weak sense of William Bechtel's minimalist definition of "standing-in for", as it is in the strong sense of Dietrich and Markman's computation-friendly definition of "mediating between"[420]. The structural mapping Turvey and Shaw have in mind is not a first-order relation by any means, in the way that Peirce's "firstness" consists of the registration of environmental qualities like hardness, or a symbol would be said to associatively map onto an object. Instead it is a higher-order derivation they call "specification", which they hope will provide a foundation for a general theory of representation. The earlier discussion of affordances made the connection between environmental attributes and their availability explicit. Affordances considered as features of surfaces and substances rather than objects as such are as permanent as anything can be; perhaps too permanent, since it seems that they would exist long after all appropriately-equipped creatures were extinct. A more relative form of permanence, however, does exist. Here, the ecological notion of "invariance" is directly relevant as it reveals important dynamic elements in perception.

An invariant is an ecological attribute that specifies some important feature of the environment; the example I use is the specification of contact with surfaces. Moving around is all very well, but creatures must also stop in the correct places. Collision with objects is generally to be avoided, but stopping at or near their surface is a common ecological demand. If a surface is at the centre of optical outflow, there will be a magnification of a nested structure in which progressively finer details emerge as the observer approaches the surface. Ecological analysis discovered an abstract property of all encounters which differentiates safe encounters from dangerous ones – it is the ratio of the observer's changing velocity to the changing "time-to-contact", which is given the name *tau*. More generally, tau can be defined as the time it takes for a gap to close given

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[419] Paul McCartney (1970). Recorded by Badfinger and Elton John.

[420] Bechtel (1998) "Representations and cognitive explanations: Assessing the dynamicists' challenge in cognitive science.", *Cognitive Science, 22*, 295-318 (html document, no page numbers); Dietrich & Markman (2003), p.97.

the present speed of closing. This is a higher-order affordance because it depends upon the relative change of two changing quantities, which is not trivial to calculate. If tau is greater than 1 the animal is accelerating, if less than 1 it is decelerating, and if equal to 0.5 the animal will stop at the surface[421]. The "animals" in question include supposedly cognition-free creatures like flies and cognition-intensive ones like humans.

The point of this example is not the technical details of tau, but the identification of an environmental property which is *abstract but invariant*. In practice, approach to an object is equivalent to making the optical contour of that object expand symmetrically. In principle, almost any sensory information can function this way – for example, a visual approach described using tau may be equivalent to moving along a gradient of odour concentration or sound intensity. It has also been proposed that various taus of closing gaps can be coupled in order to guide movements. Complex manoeuvres in sport are probably of this sort. The gaps can be defined in any dimension, such as distance, angle, or force, and can even only be present internally; however, evidence for this higher-higher-order specification is inconclusive[422]. Like the more concrete affordances, invariances are in a sense always there, given the existence of certain parameters (such as movement, perceptual systems, and physical skills) which enable their utilisation. However thinking of them in this way is to misunderstand what it means for them to be "available", since affordances are not simply part of the furniture of the world in the same way as we typically take objects to be – in the words of Merleau-Ponty echoed by David Morris, they are not part of a "ready made world". They are not "there" in the sense that they are waiting to be used, as the words of the song previously quoted out of context were apparently being broadcast to all possible hearers; or more precisely, as if available to a perceptual system considered solely as a perceptual system – instead they must emerge from dynamic interaction, as the following example makes clear.

When I walk rapidly across the mountainside near my home I often find myself on so-called "boulder-fields", which are eroded slopes of rocks of similar size with minimal vegetation cover. I find it expedient to adopt a fairly constant pace thanks

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[421] See Kim, Turvey, & Carello (1993), "Optical information about the severity of upcoming contacts." *Journal of Experimental Psychology: Human Perception & Performance, 19,* 179-93.
[422] Brouwer, Brenner, & Smeets (2003), "When is behavioral data evidence for a control theory? Tau-coupling revisited." *Motor Control, 7,* 103-110.

to the regularity of the boulder sizes, but within that even rhythm my step lengths will vary considerably depending on exactly where I place my feet. Normally I don't think about this process of walking efficiently on rough terrain, but when I am accompanied by someone with a different effective pace my performance degrades appreciably – I find that I am forced to adopt an inefficient stride pattern which requires more concentration, more effort, and conscious planning, and involves a much greater risk of error. Now although walking has an ecological-physical description in terms of coupled oscillators, that is not the point of this example. My point is that the "best" way to walk has emerged naturally from the interaction of the participating factors: the slope and other surface conditions, the size of the boulders, the length and strength of my legs, and my experience of similar conditions. Is it appropriate to describe this process as a mutual mapping from one structural component to another? I don't think so, although I do think ecological psychology has other concepts in its toolkit that may be more productive.

One such is the idea of stability and attraction towards constancy. This phrasing immediately suggests the dynamical systems description of an attractor, or basin of attraction, but set that aside for the moment. Turvey and Shaw offer "invariance detection" as a gloss on the kind of dynamic process I described in the previous paragraph, but again the psychophysical implications of seeking, finding, detecting and exploiting seem to dominate their explanation, in spite of their obvious adherence to a noncomputational paradigm. What actually happens in the kind of movement I described is something they themselves describe as "some opportunities for action persist, some newly arise, and some dissolve"[423], and in the overlapping strands of persisting, arising and dissolving mutualities of opportunity and action there emerges a relatively stable pattern, and this *feels good*. It is not that the *pattern* feels good, because the pattern is not a representation of anything, or for anything, but rather that feeling good is part of the pattern. It feels good because it works well, and it is in my interests to persist in that fashion for as long as possible. Being "in the zone" is not the exclusive preserve of semantically-challenged sporting champions!

We have many words for the patterns that emerge from walking, which go far beyond its description as coupled oscillators. Maxine Sheets-Johnstone (a trained dancer as well as a philosopher) lists a few of the phenomenological descriptions that

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[423] Turvey & Shaw (1999a), p.107.

attend that simple act – a determined walk, with firm, unswerving, measured steps; a jaunty walk, with light, cambering, exaggerated steps; a disturbed walk, with tense, erratic steps and variable gait[424]. To these we could add a litany of onomatopoeic words for movement and action, such as trot, stride, hurl, and plummet, which perhaps more directly than Johnson and Lakoff's image-schemata convey our sensitivity to the felt dimension of bodily activity[425]. In this context "sensitivity" names that delicate overlapping-strands unity that stretches from a multiplicity of worldly regularities to dynamic elaborated metaphor, via intermediate multiplicities of affordances, locomotion patterns, feeling states and image-schemata. Describing this form of connection in structural terms limited to mutuality would be to fail to do justice to the complexity involved.

How discrete are affordances? This question was noted in passing earlier, and has been largely answered with "Not at all", but the more general question is, what kind of structure do affordances have; and perhaps even more generally we could ask, what kinds of structure in the environment might enable the connection between matter and cognition outlined so far? Just in case it may be thought that the discussion is biased in favour of cognition as an outcome, a subsidiary issue is, are such cognition-friendly structures peculiar to cognition? My answer to this will be No. To start with, the kinds of "structures" in question cannot be limited to those things considered as fully-independent, stand-alone objects. It is already apparent that perception is sensitive to affordances, which rarely coincide with human-defined objects. Consequently, whatever structure affordances and the like do have must be considered as more general than objects. To start with, the question of their discreteness can be disposed of quickly. Although reference is to "an" affordance, this singularity should not be understood to refer to a bounded, discrete object. When I am walking over the rocks, certainly there will be times when a single rock forms a convenient step, or a foot-sized ledge affords a lightly-placed boot temporary purchase. But when I land on a large flat rock the only piece of it that concerns me is the piece under my boot, while the remainder fades away with no outer limit. If the rock is oriented in a convenient way it may afford several steps, and become part of my route, but even this larger affordance dims into obscurity

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[424] Sheets-Johnstone (1999b), p.267.
[425] My motivation for thinking of embodied activity in this way comes from the work of Sheets-Johnstone generally.

at the limits of my interest. And it remains true that around the edge of every intentional act there is a penumbra of related acts; as Levinas says "In doing what I willed to do, I did a thousand and one things I hadn't willed to do."[426]

In its unboundedness the affordance has an important element of in-discreteness, and this proto-structural theme is enhanced by the nature of transitions between affordances described on the previous page in the context of skilful walking; they blend into one another, but not seamlessly, as discontinuities can be apparent. There are no gaps in the flow of perceptual activity, but there will be sudden jumps as my eyes flick ahead. This continuity, in the form of in-discreteness, is not confined to dynamic activities such as walking, but is also apparent in more gentle pastimes such as the reaching for the window latch I used to illustrate multiplicity. The interrupted gesture seems abrupt, but postural adjustment and grasp alignment towards the discovered pencil do not occur as a complete unit, and are differentially spread over the short time taken – first my head, shoulders and upper body orient, overlapping with the focus of my eyes, overlapping with the change in direction of my hand, overlapping with the change of orientation of my fingers. The in-discrete continuity of the actions considered in this way is of a piece with the overlapping-strands in-discrete continuity of the feelings that *must* accompany them in order that effective movement remain possible[427]. Hence the transitions that constitute change are not phenomenal in the way David Morris wishes, using "phenomenal" in the Merleau-Pontian sense borrowed from Dillon, of being neither subjective nor objective but in that middle-region of the experienced world. Morris' conception of the purely objective enforces a radical separation, since on his account phenomena do not "obey the law of things" apparently distinctive of the objective-scientific worldview. In fact, his description of the in-discrete fading transitions from one postural orientation to another, in which the initial orientation feels less and less "compelling" and the new orientation more and more "compelling"[428], cannot be profitably separated from the in-discrete transitions of the moving body in the environment which culminate in that "in the zone" feeling of goodness-of-fit. Rather than confining the notion of emergence to the discontinuities of transition, in-discrete

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[426] Levinas (1998), "Is ontology fundamental?", in *entre nous: Thinking-of-the-other* (pp.1-11). (New York: Columbia University),.p.3.

[427] For a vivid description of the catastrophic consequences for movement when the felt component is absent see Jonathon Cole's *Pride and a daily marathon* (1995, Cambridge, MA: MIT Press).

connection underlies continuous emergence, and transition is therefore continuous. The manifestation of this as novelty will be considered more fully in the next section.

The way an affordance comes to prominence then fades into the succeeding affordance suggests an earlier analysis of the nature of phenomena conducted by Gestalt psychologists. James Gibson was influenced by this maverick (and under-appreciated) approach to perception. Although "gestalt" is popularly understood as a synonym for "whole", in the sense of a unity that exceeds the summed properties of its parts, Gaetano Kanizsa, as footnoted earlier[429] points out that it translates best as "coming to organization". This correctly highlights the emphasis on the dynamism of perception rather than its completeness or unity. It speaks to the emergence of structure with spatial *and* temporal character out of proto-structural features. Cognitive psychology, in a manner that echoes its appropriation of ecological psychology's findings without acknowledging its theoretical divergence from the mainstream, has interpreted gestalt phenomena in subjective, internalist terms – visual phenomena such as the Necker cube that involuntarily climbs out of, then leans into, the page, and the illusions of apparent length disparity[430] are said to reveal the constructive powers of the mind. From its beginnings, however, Gestalt psychology was interested in the "objective" character of experience[431], and by the time Kanizsa was writing this had become "primary process" (which David Marr glossed as "*pure* perception") to distinguish it from "secondary process", which became the focus for Marr's theorising[432].

The objectivity in question has the same subtle character discussed earlier in relation to the spatial nature of mutuality, and for the same reasons, but in this context it pays more heed to the relative permanence or invariance of the environment with respect to the perceiving organism. Wolfgang Köhler distinguished at length between a subjectivity of experience, the kind of thing introspection supposedly revealed as possessing a uniquely individual content, and subjectivity as the result of a genetic process, as the outcome of exposure to the objective world[433]. This relationship is the

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[428] Morris (2004), p.137.
[429] See 397
[430] Excellent examples can be found at this site: http://www.michaelbach.de/ot/index.html
[431] Köhler (1930), *Gestalt psychology*, (London: G. Bell), p.15.
[432] Kanizsa (1979), p.3. Note that Marr hedged his bets, describing the mid-point of his computational theory, the so-called "2$_{1/2}$-D sketch" as "the end, *perhaps*, of pure perception" (both emphases added).
[433] Köhler (1930), pp. 17-18. He uses "genetic" in its prior sense of historical process, rather than as referring to units of inheritance.

necessary consequence of an agent with a point-of-view, and represents not differentiation from the world but connection to it, a point that will be elaborated in the next section.

Experimental findings suggest two mutually-reinforcing tendencies that strengthen commitment to in-discrete connection between environment and perception. The first is negative – tendencies towards regularity, symmetry and simple completeness are not the distinctive markers of correct perception they were thought to be. The second is positive – tendencies towards dynamic extension of forms and the priority of roundness over concavity are more distinctive markers than expected. Kanizsa looks at the role the concept of *Prägnanz*, or "goodness" has played in Gestalt theory. This difficult-to-define notion has usually been glossed as regularity, balance, order, harmony, homogeneity and the like, and has been invoked as an important principle of perceptual organization. It is tempting to see the operation here of the same attraction to purity and simplicity that a proto-structural dominance of discreteness over continuity offers, as messiness and complexity are reduced to essential clarity by the operation of the mind. Kanizsa points out, however, that the attraction may tell us more about the desires of the theorists than it does about perception. When a figure overlapped by another is "completed" perceptually, for example (that is, when the figures are consciously disambiguated into separate figures), it is the dynamic extension of its outline in the direction of the lines rather than the maintenance of symmetry as such or the simplicity of the shortest path that dominates. Similarly, when two figures move together and touch so as to form an apparent overlap, it is not the maintenance of regularity which dominates the combined figure, but the continuity of the motion and a preference for convexity[434]. Although Kanizsa doesn't say this, there are obvious ecological implications: overlapping is far more prevalent than just touching; convexity matters thanks to the "bulking" or looming that always accompanies increasing proximity to objects; and pure symmetry is often more apparent than real and tends to degrade upon closer inspection. The following diagram will attempt to convey the flavour of these findings.

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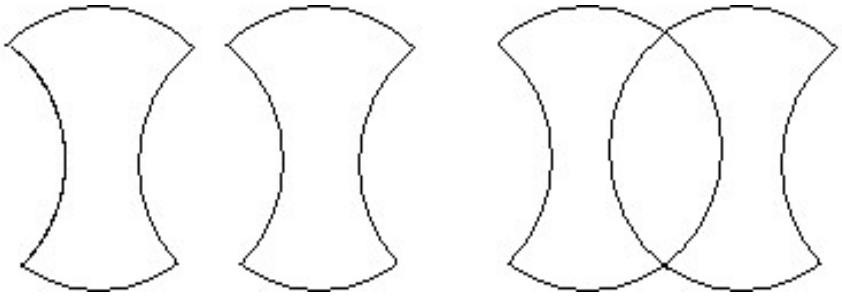
[434] From Kanizsa (1979), Ch.5 "Regularity in perceptual organization."



The first figure moves towards the second and touches, but the juxtaposition is seen not as two symmetrical figures still, but as two overlapping but less regular figures. The two-way symmetry of the original figures has been reduced to one axis[435].

One conclusion justified by this material is that the kind of "permanence" on offer is not the eternal simplicity of the real as divined (and projected) by the mind, but a relatively effective permanence of emerging structures with ecological implications. A related conclusion is that the absence of real permanence as a basis for perceptual connection with the world is negatively correlated with the actual dynamism of perceptual operations. Dynamism plays a prominent role in Köhler's thinking, and it is here, more so than in the work of Kanizsa, that the proto-structural impact of in-discreteness is apparent. I will end this section by drawing some of these from Köhler's work. Merleau-Ponty criticised the early gestaltists for their timidity in taking phenomenological insights only so far towards a partial break from the established mechanical theories[436], and in similar fashion to David Morris' criticism of ecological psychology, this stems from their refusal to embrace the internalist commitments of the alternatives on offer[437]. A starting point for the divergence of opinion over the role of internal factors is Köhler's analysis of the clang of a bell, in which, upon listening attentively, we hear several notes emerging successively in what was previously heard as

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[435] Kanizsa (1979), Figure 5.8, p.100. Thanks to Karin Molteberg for reproducing the diagram.

[436] Merleau-Ponty (1962), *Phenomenology of perception*, (Trans. Colin Smith). (London: Routledge). pp.47-51.

[437] An apologetic aside – There seems to be no satisfactory way of describing without distortion the differing emphases placed on internal and external factors within the obvious commitment to mutuality shared by all three groups of theories; gestalt, phenomenology and ecological psychology. Here, as earlier in relation to these groups, "internal" means something like "a relatively greater role for subjectivity, which is nevertheless itself defined without denying the external, in such a way that the distinction between them is redefined."

a unity. The realisation that "context" influences the sensory experience rather than it being a concatenation of point-like stimulations, should not lead to conclusions about mental powers, he says. Instead he considers the sound as a *set* of stimuli, in which the context is the set, and where the set, heard as a clang, has the same reality as the components[438].

The set concept leads Köhler to the notion of a visual field, and in the work of James Gibson this becomes the ambient optical array. The set is organised, and the basis for the organization is dynamic – the name he gives to the process by which the set of tones is also a clang is "tonal fusion". The movement of this process is itself determined dynamically by interaction[439], or as contemporary dynamicists would put it, the evolution of the dynamical system is itself dynamic. If an image containing different patches of colour is viewed, then each colour patch corresponds to a separate process in the visual field, where separation is maintained because of mutual exclusion between the properties of the processes. These processes "touch" and interact but remain as distinct strands within the perceptual unity. There is no dissolution of processes into a singular one corresponding to the unified image. In effect, differences are enhanced within the unity, though this is more true of some processes than others (Köhler cites the boundary between oil and water as an extreme metaphorical illustration)[440]. It is the necessary interaction between processes which results in the differentiation, and this interaction respects the relationship between the patches in the world. Contra James, says Köhler, it is not necessary to invoke internal, pragmatic acts which cut the continuity of sensory flow into discernible components[441].

I may have given the impression that Köhler is wholly committed to an environmental (or "worldly") basis for the sort of overlapping strands dynamism to be found in his work, but this is not the case. To a large extent the "objective character" he seeks is epistemic, a "view from everywhere", as psychology explicates the inner workings of perceptual processes. However I have not distorted his words, as he is genuinely uncertain about the commitment to the nature of reality that could follow from his new understanding of these processes. To set the record straight, consider these

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[438] Köhler (1930), p.94.
[439] Köhler (1930), p.102.
[440] Köhler (1930), pp.108-10.
[441] Köhler (1930), p.113.

equivocations. In the first he merely denies a commitment to *discrete* connection based on correspondence: "Do we have to assume that a surprising harmony is established between the laws of sensory dynamics and the area or the limits of physical things around us? No such assumption need be made, for there are exceptions to the correspondence of sensory organization and physical units."[442] He gives the example of our habit of naming grouped but physically unrelated things such as constellations of stars; and also errors, such as the two I recently experienced when I saw a sheep end-on in the morning gloom which, unmoving, became the sawn end of a log as I approached, and then raised its woolly head as I passed. Certainly there is no strict, immutable and necessary relation between objects in the world and perceptual organization. Köhler moves on to emphasise the role of the nervous system in the organization of the sensory field, but leaves a generous ontological space for the later theory of affordances. In order to counter a misapprehension about gestalt psychology, that it posits "gestalten" or segregated sensory wholes existing outside the organism and which simply project or extend into it, he says

> This is so absolutely wrong that I cannot comprehend how the misunderstanding arose. But … it is quite another problem to ask how far sensory organization, though being a characteristic achievement of the nervous system, may have an objective value at the same time. Between the physical objects around us and our eyes waves of light are the only means of communication. These do not bring the "gestalten" ready-made into the organism; rather, the segregation of wholes occurs in the nervous system; but the result may tell more about some of the objective properties of the world around us than the rays of light would be able to do.[443]

Considered purely as a physical relation, light is thus inadequate to convey "objective qualities", but nevertheless something reducible neither to external light nor to the internal "segregation of wholes" is traceable to the objective world.

From the perspective of in-discreteness Köhler is responding to a false dilemma, that on the one hand there is an absolute disjunction between nervous system and environment, represented at the time by introspectionist theory, and on the other

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[442] Köhler (1930), p.131.

hand there is total convergence between the two, represented by behaviorist theory. Such a dilemma arises because structural considerations are, as always, the building blocks of metaphysical theory, and the only choices available out of which to create these blocks are the proto-structural features of continuity or discreteness. Since continuity is literally unthinkable, the only game in town is an implicit commitment to discreteness, which as Köhler's dilemma shows, is a poor grounding for the kind of connection he seeks. Indeed his own commitment to the gestalt proto-structural distinction between figure and ground, which achieve their meaning as discrete mutualities within a unity, could be said to contribute to his problems, though I cannot pursue that here. His later adoption of the language of waves and electric current gives him a richer palette of terms with which to pursue connection in the direction of in-discreteness. This is correlated with increasing reference to neural connectivity; for example "If in a certain sense the correlate of a percept may be said to have a circumscribed local existence we shall none the less postulate that as a dynamic agent it extends into the surrounding tissue, and that by this extension its presence is represented beyond its circumscribed locus."[444] Coexisting with this is the long-standing commitment to the figure-ground distinction, where the figure now represents greater current density (an in-discrete notion) within the assumed boundary that marks figure from ground (a discrete notion)[445]. This entire work, "Dynamics in psychology" can therefore be seen as itself an in-discrete connection between the "machine theory" Köhler criticises and the decades-later application of dynamical systems theory to cognition.

The discussion in this section has commenced the task of deconstructing the significant relativities discovered at the heart of philosophical systems that implicitly espouse in-discreteness. Relative depth and relative permanence are the appearance of proto-structural in-discrete connection, in the form of a variety of manifestations of nested spatiality and overlapping strands. I looked in detail at connection as mediated by spatiality and at the emergence of dynamic patterns of engagement that in-discretely bridge spatiality. While spatiality considered in its most general way provides the conditions for the possibility of connection, it does not by itself provide the conditions for the possibility of the character of that connection, which we experience as

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[443] Köhler (1930), pp.133-4.
[444] Köhler (1942), *Dynamics in psychology*, (London: Faber & Faber), p.53.
[445] Köhler (1942), pp.62-3.

phenomenal subjectivity. Discussion of this character will emerge over the remaining sections. Theoretical positions that pay close attention to full-blown spatial concepts such as mutuality were seen to be prey to overstating the contribution of either phenomenal subjectivity or the environment. Considering the contribution of these two as jointly contributing to, rather than battling for, an emerging, rather than necessary, mutuality of in-discrete proto-structural elements results in a richer notion of connection**.** The "depth" in question became narrowed in the discussion to conceptual or semantic depth, as the depth alluded to by the classical relationship between universals and particulars was seen to embody a hierarchical structure based on part-whole causal relations, and this will be investigated further in the following section on relative determinism. Semantic depth can be seen to emerge via in-discrete connection between emergent structure in at least three domains: the environment, the agent's moving body, and the agent's intentions. Relative permanence more strongly implicates the environment end of that same in-discrete causal chain but the environment cannot be considered as a causal player in isolation from the remaining elements. Dynamic emergence was a factor in the relativities of both depth and permanence, and will be significant in the discussion that remains.

6.2 Relative Determinism

Some years after James Gibson's death, Ed Reed found it necessary to elaborate on a feature that was little emphasised in earlier ecological psychology. He called this "awareness", using it in a non-technical sense, as it was part of a broader plea for consideration of issues peripheral to the formal structure of animal-environment mutuality, but essential to the meaning of that mutuality. Affordances, he argued, provide opportunities for action; that is, they regulate behaviour but do not control it. Instead we must think of animals as having a psychology oriented towards optimising the opportunities provided, even if only in the barest sense of having interests which they are aware of as needs and desires, of recognising conflicts when choices must be weighed in relation to those interests, and of choosing paths to further those interests[446]. None of these considerations are addressed satisfactorily by looking purely at the

[446] Reed (1996), pp.16-19.

"syntax" of mutuality, analysis of which can easily degenerate into a behaviourism of mechanistic necessity.

One implication of in-discreteness is the ability to build a continuity of sorts within which discontinuities can be understood and thereby naturalised. This discussion was deferred from the previous section because it seemed that the relative depth discussed there was an appropriate way to characterise relations between *concepts* with differing influence, but it did not sit easily with causal mechanisms. This was due to the presence of two mechanisms for the scaling of causal powers that are not available to concepts; those of simple aggregation and emergence. Aggregation is a linear mechanism, in which the influence is proportional to the influence of the smallest proper part, or in other words the influence can be reduced to the sum of all the component influences. Thinking about this not reductively but constructively, aggregation names the way larger entities are built out of smaller entities so that the properties of the one large entity are just the summed properties of the many small entities. On the other hand, emergence is a nonlinear mechanism in which the influence of the whole cannot be reduced to the sum of the component influences. I have used the term many times here to indicate a constructive process by which a novel entity "emerges" from a background of the combined influence of many small entities. In these circumstances it may be difficult to arrive at a shared understanding of what the relevant proper parts are – in fact the very idea of a "proper part" may be in question.

It follows from the concept of linearity that discontinuities will not be a feature of the linear relations that result from aggregation, so that in the case of the electric current example, it is not expected that as the flow of electrons increases there may be a sudden jump in the recorded electric current, all other things being equal. This accompanies a successful program of reductive explanation which follows the discovery of the linear relationship between electrons and current, so that it becomes the case that current *just is* the flow of electrons, and current-talk represents merely a different level of explanation rather than a reference to a different ontological kind. The same cannot be said for nonlinear relations, which can be marked by qualitative differences depending on the scale. The previously introduced distinction between clouds and cyclones depends on a third factor, an atmospheric "landscape" of varying pressure; as the moist air follows the gradient of pressure in a path of least resistance what was merely an aggregation of water vapour becomes progressively formed into a moving circular mass

of less dense, hence cooler, air. Here what determines the scale of the phenomenon is the degree of change in difference in atmospheric pressure between any two points, and the result is qualitatively different depending on the steepness of that gradient of difference.

This formulation of nonlinear emergence, however, may seem to be a little too qualitative, and like the concept of information, to therefore be a little too dependent on its registration by another entity. If "registration" was, like information, to be cashed out in terms of the creation of discrete categories, that move would indeed undermine its ecological credentials. However, what does "qualitative" mean if not a difference which matters for something? Consider the growth of bacteria in a nutritious medium; in the absence of a predator they may undergo a nonlinear explosion in numbers that is "suddenly" noticeable. This kind of nonlinearity can be conceived as a change in the change, a second-order change or acceleration, which manifests on a graph as a local steepening, rather like the narrowing of isobars of air pressure on a weather map that marks the development of a cyclonic storm. It is a nonlinearity which may feature discrete units as its raw material, for example, the bacteria, but the in-discrete continuity becomes apparent as the number increases and the difference between additional individuals tends towards the infinitesimal. It has important implications for the sorts of ecological relationships discussed in the previous section, where the spatial relation of mutuality develops dynamically as a creature moves – a common example is the looming effect as nested structures approach the eyes, which is the phenomenal correlate of the invariant called tau. Again, the discontinuities of the nested structures can manifest as discrete overlappings without affecting the in-discrete continuity of their collective effect. If restating the effect of looming could have any value as a rule for successful locomotion, the rule would be something like "Stop as soon as you can when things appear to suddenly rush at you." If implemented in a symbol-processing architecture this representation would be an *extra* step, redundantly instantiating the ecological relation already implied by looming. Therefore such a nonlinearity clearly has an effect on the registering entity, and is unquestionably a causal mechanism.

Here is a different way to think about the role of in-discreteness considered as a proto-structural constituent of experience. Consider an example of the emergence of a causal entity – my finger touches two raised dots on a surface. There is psychophysical activity which results in my experiencing the impression caused by the two dots on my skin and correctly judging their separation on its surface. Now I place my entire hand on

the surface and move it around, and I discover that it is covered with raised dots – the question is, do I experience myriads of moving dots? No – I experience a *rough surface*[447]. I experience something about the surface in the large that was not present in the pair of raised dots, and that cannot be reduced to the summed effect of many raised dots. No doubt there will be a certain number of raised dots, perhaps different for each person, below which each is experienced separately, and above which the mass is experienced as a rough surface, and probably this point will change if the hand is first still then moving, and perhaps if it is cold rather than warm. But, whimsy aside, the probable existence of this point will not by itself be very interesting, although as an illustration of vagueness-in-action it might represent psychophysical, rather than semantic, borderline cases; rather, what is interesting is the difference between the consequences of the two forms of experience of the surface. Roughness, rather than a sum of experienced raised dots, has ecological implications. Perhaps this could be considered as nonlinearity at the level of the phenomenon – a *nonlinearity of emergent experience.*

I introduced a different way of achieving nonlinearity when discussing dynamical systems theory; this resulted from iterations in which each successive phase of the entity determines the next phase, but incompletely. Here too there may be discrete elements such as molecules, but their causal influence depends upon their myriad, probabilistic interactions en masse. In effect the individuality of the elements is subordinated to the matrix of their interconnections. The weather systems have this mass character, as do chemical reactions and social-cultural phenomena; and to the extent that such phenomena exhibit fairly systematic behaviour that is more event-like than object-like it is appropriate to regard them as processes. In the vocabulary I have been developing, both forms of in-discreteness are apparent in these processes – the constituent elements participate in ongoing interactions each with a limited duration, the combined effect of which is apparent as overlapping strands of constitution; while the process itself evolves through the necessity for each constituent to largely depend on its immediate substrate, the given that is its own past, as it develops in ever-expanding nested growth. The strongly relational character of influence in this environment, plus the in-discrete nature of the entities participating in relations, can allow stable

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[447] Example inspired by Köhler (1930), p.145.

configurations of novel structures to persist in forms that cannot be traced back to the aggregated influence of any discrete components that may be identifiable. The cyclone, the autopoietic organic entity, the community organization, the wave of cultural change, are all phenomena that resist prediction when looking ahead armed only with all possible current knowledge – perhaps these are evidence of nonlinearity at the level of the relations; a *nonlinearity of emergent becoming*.

Importantly, processes considered at all possible levels of analysis as strands of duration or advancing phases of history are deterministic in the normal scientific sense; that is, their behaviour can be characterised by normal mechanisms of interaction which respect the so-called "laws of nature". There is no need to give these Laws any independent existence as causal mechanisms in their own right, as the circumlocution "respect the laws of nature" would suggest. They are idealisations of actual behaviour. Another way of putting this point is to say that in-discreteness does not violate the ordering which is at the heart of deterministic process, and which we think of globally as entropy. Nesting accommodates the development of spatial relations – it is the condition of possibility for connection between agent and world, and it is the condition of possibility for any history at all. It is in the nature of the "actual behaviour" that problems for determinism arise on an in-discrete account, because the precision that ideally accompanies discreteness is not to be found. Consequently in-discrete causation is marked by the following general features that distinguish it from a standard discrete account of determinism.

First, the durational existence of unbounded entities is marked by a lack of congruence of overlapping strands, so there is no commitment to a knife-edge, instantaneous present at which nature could be carved at its causal joints. Such a present is "unconstitutional", as it were. This means that the failure of laws of nature to map precisely onto causal phenomena appears as error or "noise" in the prediction, manipulation and control of those phenomena.

Second, the spread of influence over a thick present means both that determinism in the immediate past and the (instantaneous) present is never absolute but only approximated at an unattainable limit, and also it necessarily implies an indeterminism about the immediate future. It is not necessary to embrace a strongly "chancey" view of indeterminism and to believe that reality is simply a scaling up of quantum-level probabilistic existence. This would be to ignore the solid foundation in

the past from which ongoing processes develop, and at the same time to overstate the extent to which the lack of full determinism results in complete freedom from influence. In the middle ground, however, a principled account of novelty in in-discrete terms can offer some insights into the nonlinear emergence of experience and beings. This view therefore could be described as a "conservative" indeterminism because of its commitment to a fixed past (where "past" means "prior to the admittedly liberal present") and a constrained future, by contrast with a "liberal" indeterminism that may allow backwards causation and the possibility of events that defy normal physical laws, like levitating pencils, and which bases its understanding of indeterminism on the probabilistic nature of quantum phenomena.

Third, the conjunction of these two ideas has implications for an understanding of causal relata. Events are ragged-edged things with no clear start, synchronic unity, or end, yet as the relative permanence of affordances discloses, there is an intensification of influence around some significant events that seems to give the lie to an understanding of causation that treats all events as equally significant (or insignificant). This presumed intensification might be seen to be at odds with the general process view that "all things are connected".

Fourth, a process view of productive advance can be said to necessarily implicate the entire universe in the becoming of each step of that advance. But this observation cannot be allowed to stand without qualification, as it easily degenerates into a strict determinism that claims a tightly lawlike relation between each instant of the entire universe's existence and the subsequent instant, and which can be turned into an argument for either the trivial truth or almost certain falsehood of any generalisation about causation (as Russell did)[448]. The appropriate way to think about in-discrete causation is as influence, as something that admits of degrees and a multiplicity of parts, and given the previously-identified conservative indeterminism, this must mean that influence is strongly constrained, or in Whitehead's word, is "relevant". So the "entire universe" should be read as "nothing is necessarily *exempt* from influence", or in other words there are no bounds around events such that some things can under no circumstances be involved. In practice some historical factors and ongoing events will have much stronger influence than others, and the more proximate they are historically

[448] From Russell (1913), in Corry (forthcoming).

and physically the more influence they tend to have, but it remains true that global features of the universe, affected in very small part by everything in existence, will be implicated in all becoming. For pragmatic purposes of prediction and control, near enough tends to be good enough.

Existing approaches to causation do not divide neatly along discrete and in-discrete lines, although it is possible to discern a generally implicit commitment to the discreteness of the causal relata; whether considered as energies, forces, objects or events, the tendency is for causal relata to come in well-defined units, and the better-defined their units, the more deterministic is the causation. Causation is primarily a philosophical concept, distinct from though often aligned or compatible with a purely scientific notion of determinism. This allows a wide range of metaphysical approaches, some of which demand considerable commitment to deeper metaphysical issues than others. In-discrete causation is broadly compatible with standard scientific accounts of causation, thanks to its close relationship with temporal asymmetry, its naturalised understanding of forces, and its allowance of probabilistic or chance-raising causation. For example, Whitehead's understanding of causation revolves around reconciling efficient and final causes through the process of concrescence, and here "efficient" means energy, which sums in linear and nonlinear fashion as process advances. Of course the role of final causation in process is more compatible with current ideas of dynamical attractors than it was to Whitehead's science contemporaries, and the transition from object to subject effected through causation (to be discussed further below) is foreign to them too. In-discrete causation is also broadly compatible with the currently popular counterfactual accounts of causation (but more weakly still, in the sense that it does not apparently violate them); these are literally "accounts" in the semantic domain and are directed towards an understanding of an agent's responsibility for a certain effect. A brief clarification of the nature of this weak compatibility will serve to round off my discussion of causation.

The causal relata for counterfactual analysis are events, understood in an everyday sense, for example, my typing these words; my opening the door of the refrigerator; the dog dying. Interestingly, these events are vaguely defined, that is they do not have a precise set of descriptions which allow their complete characterisation, but this does not matter, as the notion of "cause" operating here is precisely that of an event as conventionally understood. Consider a scenario; I drive away from the house, and run

over a lizard on the driveway. It is trivially true that it was the contact of the car wheels with the lizard that killed it, in a strictly deterministic sense, but that is not a good answer to questions about the causation involved. Just how inevitable is it that the lizard should have died? Broadly there are two events involved, me driving down the driveway (the cause), and the lizard dying on the driveway (the effect). We are asked to consider ways in which variation in the antecedent event could affect the consequent event, by making a (hopefully) minor change to the description. Some variations on the counterfactual theme talk of a "small miracle" being inserted into the account which serves to change events in the desired way, because of course the conceptual hurdle to be overcome is that the events actually happened, yet we are thinking of them as though reality could change just by thinking about it.

The small miracle intervention is required if strict determinism is to be tampered with, but on the counterfactual model proposed by David Lewis this is not necessary as the causal relata are semantic constructions – vague predicates. Instead of worrying about the cosmic impact of my leaving the house five seconds earlier, this small variation in the facts is comfortably allowed for within the vague description "I drove down the driveway." However since the "laws of nature" are invoked to manage the behaviour of all other elements of the description which are not explicitly varied, the intervention should not be too large and should be explicable within the semantic constraints of the causal scenario. For Lewis-style counterfactuals the specific intervention is the negation of the antecedent – we are to imagine that I did *not* drive down the driveway. Would the lizard have died? If the answer is No, then it is clear that I killed the lizard. What this means may depend upon other causal factors, which are also understandable counterfactually. If the driveway was quite busy, then knowing that lizards are slow-moving and fond of lying in driveways anyway may incline the causal analyst towards a fatalistic view of the lizard's doomed future – even if it wasn't me driving just then, a variation in departure of a few minutes would have made no difference; it could have been curtains for the lizard on any number of occasions. My obvious inattention is placed in its proper perspective, and I am partly, though perhaps not wholly, absolved of blame. The same causal conclusion would not apply in the case of a small, fast-moving creature that had to be in exactly the right place at exactly the right time to be squashed by my car – if I had not driven just then, it would undoubtedly have survived. Here the counterfactual analysis has clarified the causal process by

appropriately manipulating the causal relata defined at just the right level; not the microlevel of forces or the macrolevel of the state of affairs of the whole world, but the "event" of driving my car down the driveway at roughly that time[449]. It seems like a very neat package, so why could it be questionable? Actually any in-discrete worries about counterfactual accounts of causation should be put in perspective – there is nothing particularly objectionable in counterfactual accounts, and in the following paragraphs they will simply serve to demonstrate the shortcomings of discrete thinking generally.

Although the causal relata are vague predicates, they act as categorical facts about the world[450]. Although it is not necessary or possible to precisely define it, "my driving down the driveway" is a causal unit every bit as discrete as a billiard ball. This is reflected in Lewis' innovative "neuron diagrams" that convey the causal agents as if they were particles connected by enhancing or inhibiting forces. In a scenario as basic as that particular causal unit followed by "caused the lizard to die" this discreteness is no problem because our intuitions about the interrelations within simple occasions allow us to blend the two units together and manipulate the combination in various counterfactually-relevant ways, some of which I touched on above. In effect we gloss over the relevant distinction between semantic intervention and actual forceful intervention when things are simple, perhaps because intentionality and causality are so closely aligned in everyday events from a first-person perspective. Things become a great deal less intuitive when the causal relata are connected in more complex ways that demand a great deal more of our understanding of events; for example, in chains of causation that instantiate potentially transitive causes; and in branching causation where various enhancing or inhibitory or pre-emptive events take place. In these cases that continue to rely on categorical events, an understanding of the way the concept of "cause" works when transmitted categorically and completely as counterfactual responsibility becomes difficult to reconcile with an understanding of the way actual things and processes work, and here intuitively we appreciate that causal influence works partially and by degrees, and not categorically[451].

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[449] The counterfactual story is derived from Collins, Hall & Paul (2004), "Counterfactuals and causation: History, problems, and perspectives." In John Collins, Ned Hall, & L.A. Paul (eds.) *Causation and counterfactuals* (pp.1-58). (Cambridge, MA: MIT Press, Bradford Books).

[450] Collins, Hall & Paul (2004), p.12.

[451] One of David Lewis' last papers was "Causation as influence" (reprinted with amendments in Collins, Hall & Paul, editors, 2004). Although "influence" is explicitly addressed, it is cashed-out in terms of a

More importantly, counterfactual accounts are always applied retrospectively to causal relata that emerge ready-made from an account. The notion of "possibility" which enables counterfactual intervention in the account is always therefore influenced by classical probability, in the sense that there is presumed to be a well-defined, if not entirely regular, problem-space, which can be completely divided fairly neatly into intuitively acceptable and discrete sub-categories. Although events are acknowledged to be vaguely-defined, there is no logical problem with negating such an entity, for instance, or in assuming that "it" could have been just a little different while still being that event. The description "I drove down my driveway" supervenes on a huge number of detailed descriptions of actual and possible causal exchanges all of which are deemed to be irrelevant, given our knowledge of the causal event in question. There is no place for the novelty and creation of in-discrete reality, and no place for any emergence of experience or becoming, because all actual change is subsumed under a description. This would suggest that counterfactual accounts of causation, though not explicitly committed to it, are most compatible with a four-dimensional view of the universe, the so-called block universe where time is an actual dimension and entities can be conceived as having "length", or perdurance, along their lifespan. This is a godlike view of duration and a denial of the importance of change.

Hence the typical account of causation, while it may not explicitly embrace a substantialist understanding of reality, is inclined towards a discrete notion of the present and a limited notion of possibility. As the previous discussion of process revealed, possibility or potentiality are constituted in-discretely by the present incompleteness of becoming – in the barest sense, that is without invoking any extra entities like Whitehead's eternal objects, the contemporary lack of fulfilment of a concrescence is what enables its future experience. So rather than creativity just being an indispensable doctrinal element in process, it is an irreducible metaphysical element of an in-discrete metaphysic. Whitehead's particular view of process has two additional routes for indetermination. The first is thanks to his requirement, discussed earlier in the context of his apparent desire to retain atomicity within continuous becoming, that actual entities be compatible with contemporary science and standard views of determinism. This

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fine-grained analysis of the event, which is already accepted as being vague. The categorical nature of the event is unaffected.

means that they be, however briefly, complete and independent of their fellow actual entities, and here independent means that none belong in the past of the others. Rather than their essential incompleteness providing the only space for "conservative" indeterminism, in this case it is the infinitesimal pause before the next phase of the object/event begins that "provides each actuality with a welcome environment for irresponsibility."[452] The second is due to the passage within process from simple objectivity to more complex subjectivity, and although this seems on the face of it to be a more peculiar activity than the first, it is actually less idiosyncratic and more beholden to the inner logic of process. It is this activity that will assume more prominence in the following discussion.

The first major section of this chapter extensively discussed the notion of mutuality, and the kind of spatiality offered by an in-discrete understanding of nested continuity. This, it seemed, offered up the conditions of possibility for connection, and the form of such connection, while the proto-structural in-discreteness of overlapping strands provided much of the content in the form of the seeking, detection and utilisation of affordances. However, in spite of there being no constitutional limit on the amount of such information, there seemed to be a shortcoming in its nature. Recall the words of Reed, quoted at the beginning of this section, who pointed out that affordances provide opportunities for action but they do not control it. This is a recognition that mutuality by itself is not sufficient to explain what, broadly, we think of as agency. Nested in-discreteness provides a framework for mutuality within which affordances, Gestalt structures and embodied cognition make sense, but an extra ingredient is required to enliven this spatiality. It is not necessary that this be mysterious or even immaterial, but it should be part-and-parcel of this spatiality, something attendant on it rather than superadded to it. Hence David Morris' appeal to "lived depth", Bergson's invocation of intuition, and even Reed's use of "awareness" to try to convey that extra thing in a naturalized way. My claim is simple; that the most natural way to conceive of this quality is as a proto-structural implication of in-discreteness, in particular that aspect of it that implicates an indeterminate future. This is an essential and irreducible creativity, though of a more mundane variety than would be associated with a tag of "artistic genius".

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[452] Whitehead (1933), *Adventures of ideas*, (Harmondsworth: Penguin), p.227.

The necessary incompleteness of objects and events is the starting point for consideration of in-discrete subjectivity. This will be important both synchronically and diachronically. In the former, incompleteness of the present creates space for novel acts and imaginative projection, as well as providing the condition of possibility for the dynamic emergence and reinforcement of subjectivity in passing, as it were. In the latter, incompleteness of becoming is an essential existential condition for the subjectivity of more complex beings. Whitehead's denial of an absolutely unchanging subject is reflective of the relation between experience and that which experiences, so it does not apply only to complex humans – he said "An actual entity is at once the subject experiencing and the superject of its experiences. It is subject-superject, and neither half of this description can be lost sight of."[453] I do not intend this section to be a full-blown analysis of subjectivity and self-consciousness, or even consciousness in general. All of those are too significant to do justice to within the scope of this project. All I wish to do is demonstrate the possibility that proto-structural principles of in-discreteness can be the conditions for the possibility of such a for-itself character, and consistent with process philosophy, that it is an unreasonable assumption that this character be quarantined within a sophisticated human cognitive architecture.

At two points earlier in this work I used structural understandings of connection that drew attention to the possibility of a basic asymmetry in connection. When discussing holism it became apparent that an inner-outer distinction could be implied by the structure of a web of connection, given some minimally necessary conditions such as a definition of beings as concentrations of intensity at the nodes of the web. Their preservative actions could not be equally directed to all parts of the web, and would tend to be proportionate to the concentration at their known node. Such beings, if endowed with any capacity for preservation, would inevitably relate to the remainder of the web as a unity to a multiplicity, so that preservation in general would inevitably begin with a *self*-preservation. For the second reference to asymmetry of connection, at the start of this chapter the discussion of mutuality uncovered the bridging role of nested in-discreteness, which enables the fullness of the ambient environment to connect the perceiver to the world in many ways mediated by the perceiver's actions that emphasise the particular nature of their own end of that bridge. Again, this is a structural relation

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[453] *Process and reality*, p.29.

that favours resolution into a unity related to a multiplicity, but importantly in neither situation was it necessary to invest that "unity" with any extra capacities to convey the point that such a unity was a feature of the structure. Even the unity is just a by-product of the fact of connection. However the point was made that the fact of connection by itself could not explain all the relevant features of the "inner-ness" that was constitutive of the relational character of the nodes of the web, or the "me-ness" that was constitutive of the spatial character of the near end of that bridging relation. These features, constitutive of a subjectivity, emerge nonlinearly from activity. They are a necessary accompaniment to change.

Consider first an account of subjectivity that also rests upon proto-structural elements common to self and world, but without ascribing a crucial role to novelty. David Morris develops his idea of a "sens" of space from the work of Merleau-Ponty. Morris accepts much of ecological psychology's findings, but only up to a point. For example, the visual world is a world of surfaces, jointed, connected and overlaid, and hence we perceive "envelopes" of volume that are a flow of parts "that continually unfold into and envelop one another in movement", rather than the mass of a "fully present solid thing". Following Husserl and Merleau-Ponty means accepting that this limitation on our knowledge of things implies that knowledge of qualities such as "solidity" means compensating for a "quasi-absence" by continually replenishing it during perceptual exploration[454]. This process of replenishment distinguishes Morris' approach from ecological psychology, which says that appropriate information would be available in a more strongly objective sense, and that solidity is specified in a much less fragile way than Morris suggests. The movement that accompanies exploration is, for Morris, the source of a critical phenomenal understanding of space that cannot be reduced to an account of affordances. Movement is the source of what Morris identifies as the condition of possibility for any spatial experience, what he calls a "topology of envelopment". Zones of the body envelop each other, or are nested, in functional relations that can extend beyond the limits of the skin in the way a cane is used for probing the ground ahead of a walker.[455]

Envelopment, nesting, is structurally common to both perceptual body and

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[454] Morris (2004), pp.107-8.
[455] Morris (2004), pp. 114-6.

perceptual objects, and when body and world "cross", their mutual envelopment gives us an "inner envelope" of pre-objective things related to bodily space, that mediates between the fully objective outer envelope of space, and the subjective self. The logic of envelopment allows an idea of folding, where the many are reduced to the one. Different "grammars" of envelopment inform us of the substantial qualities of enfolded surfaces, such as rigidity, sponginess etc. What is actually going on when a movement pattern "summarizes" some critical physical properties of an object is a reduction of complexity, or a collapse of degrees of freedom, that is not dissimilar to the response to an invariant or an affordance. Morris proposes a more active involvement at the micro-bodily level, including the cognitive ingredient of anticipation, than ecological psychology would bother with. He explains:

> The movement in which zones envelop one another and thence envelop things in exploration is constituted by a tensed separation between the body and things. I feel the cork *here* and *now*, but this feeling is constituted by an anticipatory wiggling stretched, tensed, in space and time … Encounters folded through this 'thickness' of enveloping movement become express as a thing in primordial depth.[456]

If you are seeking an account in which subjectivity is not taken for granted as a given, then this is one route to a dynamic, constructive explanation.

The proto-structural elements are primarily surfaces, and their arrangement into overlapping envelopes allows a common topological function that links the creature and the world in a way that partly constitutes both. This is a much more mediated account than ecological psychology's, both in the complexity of the topological relation when body and world cross, and in the apparently necessary involvement of "anticipation" and other inner processes. The role of mediation becomes clearer when Morris analyses the radically different sense of space that emerges in weightlessness, where his aim is to reveal an emotional sens that colours our sens of up and down. But we should not take "emotion" too cognitively, since he draws an analogy between the "phantom Earth" of weightlessness and a phantom limb, the response to which reveals the mapping between actual (now missing) flesh and habitual ways of moving. So

emotion here is like an ingrained habit of responding, or a stance or attitude towards the world, which is also expressed as a "deep grammar" where body-world relations reappear through meaning and language use in the way investigated by Lakoff and Johnson. The analysis moves progressively outwards, and as the innermost being is enfolded within the "inner envelope", which is within the outer envelope of objective space, so too objective space gains meaning from being enfolded within a place; from here Morris follows Heidegger (and Ed Casey and Jeff Malpas, amongst others) to find an originary ethical position in relation to place and others which is, in its way, a precursor to subjectivity.

Hence what started out with an appearance of subjectivity-driven connection becomes a loop, or fold, in which the world plays an essential part in the constitution and content of the subject. In-discretely this connection is maintained solely through nested surfaces, where their continuity derives from movement. Call this an in-discrete reading of phenomenology, if you like, by contrast to an in-discrete reading of process. What they have in common is an essential incompleteness which in its lack provides the driver or dynamic impulse to make good its own absence. This is a "self"-organization that ultimately implicates a self, in spite of Morris' protestations about the standard discourse on self-organization being overly imbued with strictly objectivist implications. However within the context of Morris' appeal to a transcendental style of argument the necessary incompleteness cannot be thought of positively, but rather must be taken literally as an absence of something – each new level of enveloping structure provides more meaning with which to compensate for the "quasi-absence" of the qualities of the real object, right back at the entry-level of perception according to Merleau-Ponty. Unlike the in-discreteness of process, which is explicitly based on overlapping strands but within a nested structure, phenomenology is dominated by fields and surfaces. This may reflect its lack of interest in genetic, evolutionary explanation (using both terms in their broad, nonbiological sense), both of which concepts involve history, change and directionality. Or it may reflect the legacy of Kantian metaphysics, which emphasised the constitutive role of a topological-spatial model of a reality poised between cognition and the world, in which explanation tends to remain within the context of a static model of mutual logical dependency. Either way, the absence of an elemental aspect to the in-

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[456] Morris (2004), p.119. Emphases in the original.

discreteness means that a proto-structural tool for jointly elaborating on incompleteness and explaining novelty is simply not available. These gaps are filled in an in-discrete reading of process.

I will set to one side Whitehead's view of causal independence (and the room it allows entities to indulge in a little irresponsibility), to focus in the last part of this section on the vital role that the indeterminism in becoming plays in the constitution of subjectivity. First off, I need to reiterate that the indeterminism at issue here is not of the liberal kind based on quantum existence, which scales up to a kind of drunkard's-walk vision of the progress of the actual world. The novelty of process is of a more humble, low-level sort, however it is ubiquitous so it has considerable impact. It can be thought of in a way compatible with Leibniz's monads, and this emphasises the individuality of each novel creation through its relations to the whole of nature. It can also be thought of in a genetic, or more linear fashion, as the nonactual tip of an entity stretching from the past into the future, and this emphasises the creativity of each novel individual. Together these suggest, without being definitive, an in-discrete route to subjectivity, and that is all I can achieve within the scope of this project.

The similarity with monads is this: the universe is productive, more of it is produced continuously, and the form of production is new entities. Each one bears the stamp of the entire actual universe (as well as the influence of a host of eternal objects), and its creation marks a new phase of the actual universe as a new region of spacetime extends and incorporates its predecessor. At this admittedly fleeting moment, the new entity is representative of the whole universe, although unlike a monad it does not mirror that universe faithfully. Novelty is guaranteed because, like the monads, each new creation receives the filtered and transformed influence of all its predecessors. It remains true that, as Whitehead says, "Causation is nothing else than one outcome of the principle that every actual entity has to house *its* actual world."[457] Individuality is therefore guaranteed for each new entity, though as I pointed out in the chapter on process, such an entity may be nothing more than a new "timeslice" of an existing individual. Nevertheless, at any given time it is unique by comparison to its contemporaries, who may have nearly identical histories. Hence the individuality of each novel creation exemplifies creativity as the ultimate principle of nature, in the becoming

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[457] *Process and reality*, p.80. Emphasis in the original.

of a new unity. Process considered in this way exemplifies the nonlinearity of emergent becoming.

Considered genetically each creature is at the apex of a lineage – it is the culmination of directed changes as influenced by a history of environmental conditions. Becoming is a thoroughly causal process, and an application of the ontological principle in causal terms means that the reasons for things are always found in their composite nature, and to search for a reason (efficient cause) therefore means to search for a prior actual entity, while to search for a reason (final cause) means to search for a subsequent actual entity. The incompleteness of becoming is a consequence of this composite nature, which consists of a amalgam of two elements: One that *gives* influence (the physical, or objective pole), and one that *seeks* and *receives* influence (the mental, or subjective pole). One implication of this is that every entity is a subject, that is, it has a capacity to be affected, or influenced – this is the foundation principle of panpsychism, and again is a characteristic shared with monads. Novelty is guaranteed because the transmission of form within concrescence is never total and unchanging, but depends on the jostling, enhancing and inhibiting, grafting and pruning actions of the concrescing "ecology" into which the new creature is becoming. This proceeds with the mental pole acting on its incompleteness by feeling for physical data to make it complete. Hence the creativity of each novel individual exemplifies creativity as the ultimate principle of nature, in the becoming of diversity. Process considered in this way exemplifies the nonlinearity of emergent experience.

In relation to this last characterisation of process, the element missing from a purely spatial analysis of mutuality is the sensitivity of the actual occasion/entity to its lack. Although this looks to be a *peculiarity* of Whitehead's particular account of process, this is not the case. Given an in-discrete proto-structure characterised in terms of overlapping strands, then incompleteness and over-flowing of the present into the future are consequences of the unbounded nature of beings. That the future should be able to supply some of the missing material is no surprise, since at its heart this is what agency in complex creatures is. A possibly surprising aspect is that all creatures enjoy the same basic architecture of subjective fulfilment, but again this follows rather naturally from the holist causation that denies any natural boundaries to influence, which would include any boundary posited between sensible and insensible matter. This sensitivity is a qualitative aspect of that spatial character which is not itself spatial, and

although it has an orienting influence on the course of concrescence the orientation makes no sense in spatial terms, and is more like a temporal orientation towards a future which is of its own making. Causation in general is the operation of this sensitivity on a cosmic scale, termed "causal objectification" by Whitehead, where what is felt *subjectively* by the objectified actual entity is transmitted *objectively* to the superceding actualities[458]. Therefore in spite of sharing the idea of an essential deficit it is very unlike the perceptual "quasi-absence" postulated by Merleau-Ponty and Morris that is peculiar to the phenomenal realm of complex cognizers, and that can be overcome within the confines of a movement-generated act of perception.

The attraction of a common proto-structural element shared by causation and that which transcends it is obvious. It is not the simplicity of a shared reductive explanation, with its promise of a shared mechanism, that attracts, but the simplicity of a shared principle. This principle was always there at the heart of thought, but its content was discrete. It never explained anything directly but its influence was manifold, so varied that its common nature rarely intruded into thinking about things. Now that attention has been drawn to the ubiquity of discrete thinking, its alternative is immediately thinkable, at least counterfactually! In-discreteness does not solve the problem of causation, but it provides a means to draw causation and semantics closer together in a common notion of "influence" that straddles efficient and conceptual power. The wielder of the power, the agent or subject, has a dual nature as both determiner and determined, neither of which can be said to be prior to the other. They must be responsive to the power relations they are embedded in, as well as sensitive to the application of their own power on their surroundings. In-discreteness as a condition of possibility provides the common ground for this two-way sensitivity, which rests upon the dual basis of in-discrete connection and essential novelty. Hence the promise of connection comes with a guaranteed short-coming of incompleteness, which is a blessing or a curse depending on one's perspective. The final substantive section of this chapter will look a little further at what happens when semantics and causation fail to cohere. It will take up the issue of the indeterminacy that results from in-discrete connection.

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[458] From *Process and reality*, p.58. Emphases in the original.

6.3 Relative Determinacy

The discussion of indeterminacy in Chapter Four was motivated by a distinction between beliefs about the given-ness of objects and the relativity of objects. That discussion, plus the discussions of mutuality, spatial connection and in-discrete causation in the foregoing major sections of this chapter, will have doubtless reinforced the impression that the locus of the indeterminacy at issue is the in-discreteness of the object itself. In this section I wish to correct this impression, and I will start by referring back to a distinction made in the previous section when discussing emergence. There the interlocking facets of the emergence of novelty were separated as a nonlinearity of emergent becoming, and a nonlinearity of emergent experience, and relatively more attention was paid to the latter. However it should be clear, at least on a process account of in-discreteness, that novelty is a global feature of reality and not just a fine-grained addition to certain unusual pieces of it. Further, while it manifests as newness and difference, these aspects are only apparently concentrated into startlingly original creatures, the so-called emergent becomings, and in fact are characteristics to be found across all creatures and at all times. In this section I wish to briefly discuss a further implication of novelty; the idea of plenitude, and the role this global feature plays in indeterminacy.

Plenitude is fullness. To say that reality is a plenum is to say that it is full – that there is no space between things. The idea has been associated with theological understandings of reality, where it is a correlate of perfection, in the sense that the most perfect world would have no space available for further perfection to fill, hence it must be as full as possible. This suggests a further role for the concept of “possibility”, since in such a world it is expected that all and only the best possibilities will be actualised. Leibniz’s monadology is a “perfect” example, where each newly created monad contains a reflection of the entire universe at the moment of its creation, and monads are created continuously, so by definition they fill the universe. The alternative is to believe that space and objects are quite distinct substances, and that objects matter significantly more than the space between them. This position is probably adopted implicitly and by default. It may be the case that novelty can be entertained in a discrete metaphysic only via the topmost principle in its hierarchy of being, and not as a principle wedded to every form of being, but I will not argue for that. I do need to establish the link between

plenitude and in-discreteness, since it may be that the indeterminacy that is the subject of this section can be arrived at without postulating fullness.

Many of the objects that surround us do not change very much – they are called "inanimate" for good reason. Their duration is regular, their rhythm repetitive. When they do change noticeably, human agency is often to blame. I dribble coffee on a book, hand it to a colleague, write something on the whiteboard, then erase it. In the meantime, a book in the sun yellows imperceptibly. Things are quite different when we are surrounded by living things, and here we notice without effort that life is movement, activity, sound and smell – it is ceaseless change and endless novelty. Process theorists make a significant distinction between living and nonliving entities. The living exhibit more of everything, but are also different in kind. They are a conduit for converting bits of the inanimate world into animate flesh, which they do constantly, so the inanimate world, although seeming to change little, is nevertheless being incorporated into, and eventually disaggregated from, the living. Away from the relative stability that is the office environment there is much going on. The inanimate animates the living with every gust of wind, and the living animates the inanimate at every step and breath. Each gust or breath changes everything, in the sense that a new pattern comes into being at every moment, and a new configuration of relations is available at each instant that now can support action, when it couldn't just an instant before. There is no cosmic metronome beating out distinct steps at which reality marches on by another pace, between which lie nothing. Instead all this change is occurring in overlapping cycles of irregularity, in overlapping strands of duration that deliver new change continuously. There is a spatial plenitude as well as a temporal one, though the limits of the space are relative to the perceptual acuity of the entities in it. Unless circumstances are highly unusual, the ambient array of ecological information will be changing constantly – the scenes available for visual systems, the sounds available for auditory systems, and the wafted fragments of material available for olfactory systems. Something changes at any moment, and in any place in the immediate surrounds; and if all else is still there is nevertheless the entity's own body as a source of change.

As the previous discussion of mutuality and the emergence of structure revealed, it is the particular needs of a moving creature that determine which pieces of its surrounds it needs to pay attention to. A moving creature creates a flow of potential as it moves, a plenitude of possibilities for enhancing the journey, pausing productively,

or utilising pragmatically. Using an affordance means temporarily, perhaps ever so fleetingly, "fixing" a part of the world that emerges from the flow of motion so that it functions in a derived way to support one's activity. It is briefly made to do something extraordinary, such as act as a step or a seat, or to provide a sip of sweet liquid. How it does this is not pre-established by its own "nature", and the limits of the potential it offers are not bounded by its own structure. The creature immediately following will not necessarily make use of exactly the same set of features, and will not necessarily respond in the same way to the details it perceives. If I turn to the person behind me on the rough track and say "watch out for that rock, it wobbles", I may need to be sure I'm gesturing exactly at the correct rock if they are inexperienced at such walking, but I need not be so precise if they are experienced because they, like me, will judge its resting position and distribution of weight to be risky just by glancing at it. For most communication purposes, then "that wobbly rock" will be a vague description, unless augmented by a clear visual signal like a finger-point. Its meaning depends solely upon the shared experience of walking on or over it. Normally when we use language we are not so sensitive to the possibility that meaning may not be shared, and may even be peculiar to one's own point of view. Things aren't changing constantly, and we take our shared experiences of the world for granted. When I ask "have you got that book I lent you?" I don't usually need to point at it. So we think that words and concepts have a fixed meaning because we rarely have to pause to consider how an alternative meaning could possibly arise from our coupled interests.

In a plenitude, all acts of meaning ascription are, to varying degrees, acts of approximation. This is not because of necessary failures in the perceptual apparatus used, that it fails because of its own shortcomings to map precisely onto the structure of the world; nor is it due to the fundamental indistinctness of the world, that it fails because of its lack of clarity to be the sort of thing that other things can represent. Instead it is due to the very conditions that make perception possible in the first place – proto-structural in-discreteness that implicates conservative novelty, pattern emergence and plenitude, on the side of the world; and proto-structural in-discreteness that implicates pattern detection, subjectivity and movement on the side of the creature. A potential infinity of significant events being interacted with dynamically by a huge variety of interested creatures results in an infinite number of potential relations. Adding a communication strategy dependent on shared concepts and structured vocalisations,

that is adding language, to the creature side of the equation cannot collapse a potential multiplicity of encounters into a single bounded entity by stipulation. If you factor in the multiple connections between the average number of concepts that contribute to a typical meaningful interaction with others, the resulting "description space" has an immense number of degrees of freedom. Hence indeterminacy is an inevitable consequence of in-discreteness. Having said that, perhaps determinacy *can* be achieved by implementing an appropriately rigorous ideology. Recall how single-minded the dystopia of Orwell's *1984* had to be in order to achieve the organised control of thought that approximated determinacy. It took a culture of complete artifice to achieve this.

The link between in-discreteness, plenitude and indeterminacy seems strong. It seems so strong that we might wonder how any semantics could possibly work given the apparent impossibility of coherently ordering the variety on offer, though we could start by pointing to the degree of commonality that results from possession of similar animal bodies and shared cultural norms. The same kinds of regularities are noticed by different cultures for the same sorts of reasons, that they are in fact relatively invariant features of their worlds. The grounding of meaning in everyday experiences would lead us back to Davidson and radical interpretation, Lakoff and Johnson's cognitive semantics, and Wierzbicka's Natural Semantic Metalanguage; all ways of reducing plenitude to manageable proportions. This is something we all do, all the time. Some previous metaphysical systems have reserved this role for God.

Chapter Seven – Concluding Remarks

An in-discrete metaphysic should not be viewed as an attempt to ground all understanding in a single interpretive framework. Although it might seem to fit quite well within what Peter Strawson describes, in words quoted at the beginning of this work, as a descriptive metaphysic, an in-discrete metaphysic does not seek to "lay bare the most general features of our conceptual structure". In spite of arguing that the necessity for discreteness is a presumption underlying a wide variety of structural understandings of experience, and that discreteness is a necessary condition of possibility for certain kinds of structure, so discreteness (and continuity and in-discreteness) are therefore *proto-structural* concepts, the scope of an in-discrete metaphysic is both more and less ambitious than Strawson's understanding of the task of descriptive metaphysics – less ambitious, because the outcome is far from a systematic exposition of our conceptual structure (taken as unified); and more ambitious, because it links conceptual structures (most probably multiple) to larger structural features of the world.

Two significant implications of discreteness were proposed in Chapter One: that an emphasis on individuals can blind us to the connections between them, which need not be of a quite different ontological nature; and that the apparent readiness with which individuals stand out from their background can blind us to the deep connections within that background which allow individuals to be those individuals at all. Discrete thinking therefore encourages the development of two philosophical problem areas of long standing: the nature of subjectivity, inhering in the bounded individual rather than being a feature of the integrated structure, assumes a special place in thought; and an exaggerated distinction between appearance and reality flourishes in the absence of a principled integration within the real. In-discreteness, it was suggested, provides the resources to undercut these problems, and the remainder of the thesis attempted to make clear how this could be done; first by linking in-discreteness to an appropriate substance metaphysic, that of Aristotle, which embodies connection and complex unity at its heart; next by associating in-discreteness with alternative conceptual approaches to continuity which can support individuality while approximating continuity, and in so doing also allow a reconception of the nature of bounds; then by demonstrating in-discrete principles in action, as it were, in a number of theoretical and practical approaches to

knowledge, thought and action which self-consciously attempt to counter discrete thinking though without putting it in those terms; and finally by looking at a metaphysic which explicitly reconceives subjectivity and connection.

The overarching metaphysic embodying in-discrete principles already exists, and is called process philosophy. At a small scale, in its engine-room, so to speak, lies in-discreteness. For such a metaphysic, an appeal to transcendence, far from being a natural implication, demands explanation. It can come only in the form and characteristics of the totality of all that is, bounded from within, and even this form of transcendence sits uneasily with in-discreteness since it presupposes that a conception of the totality is valid, whereas in-discrete reality is incomplete and therefore only ever provisionally "total". It is this provisional totality that forms the causal backdrop of influence when a process philosophy avers that each becoming is influenced by "all that is". On the other hand a limited form of transcendence is native to in-discreteness, since "going beyond" does not require violating bounds or moving to a new absolute level of completeness – such transitions of crossing and re-contextualising are constitutive of in-discreteness. They are not so much transitions-to as passages-through. Overlapping strands provide links from one partial unity to another at a common ontological level, while nesting provides paths of implication or inclusion that lead to ever-larger contexts. The immanence of the resulting "here-and-now" is an immanence that blends the profound and the trivial, because "here" and "now" are transformed concepts.

This project began with the hope of making some sense of the troubling metaphysical gulf between various pairs of significant concepts – between appearance and reality, thought and the world, immanence and transcendence. It is common to either treat oppositional concepts as being essentially incompatible, from which lessons about metaphysical humility can be learned, or as so deeply compatible that a metaphysic of great complexity is required to detail their relations. Neither course is attractive to a pragmatist with a rationalist bent – for such a person it seems that there must be, in response to being offered the aporia strategy, a more fundamental element that can explain away the aporia; while on being offered the systematic solution the response is to look for an element that simplifies the structure while preserving the relations formerly dependent on the putative levels. This could not be a search for a first philosophy, as plenty of lumbering wrecks have blocked that road in futile attempts to improve on Aristotle. It could not be an eliminative strategy either, as nothing is

achieved by telling people that those things they thought were important are, in reality, either irrelevant or non-existent. Offering something new that can be assimilated to all existing stories is an attractive alternative, however, especially if its implications eventually result in the realisation that some of the existing stories must be wrong.. Finding this something new lying unnamed and apparently unnoticed in a variety of places gives some hope that it has real impact, So something much more humble than systematic metaphysics has occurred, and my task in this project, with apologies for the laboured construction metaphor, has turned out to be akin to clarifying the role of the mortar that binds the stone rather than providing the architect's drawing that explains the whole building. And that is quietly satisfying.

References

Aristotle. (1952) *Metaphysics* (Trans. W.D.Ross, reprinted from *The works of Aristotle*, ed. W.D.Ross, OUP). (Chicago: Encyclopedia Britannica).

Aristotle. (1952) *Physics* (Trans. R.P.Hardie & R.K.Gaye, reprinted from *The works of Aristotle*, ed. W.D.Ross, OUP). (Chicago: Encyclopedia Britannica).

Bateson, Gregory (1973) *Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution and epistemology*. (St. Albans: Granada).

Bechtel, W. (1998). "Representations and cognitive explanations: Assessing the dynamicists' challenge in cognitive science." *Cognitive Science, 22*, 295-318.

Bergson, Henri (1935) *The two sources of morality and religion*. (New York: Henry Holt).

Bergson, Henri (1946a/1911) "Philosophical intuition", in *The Creative Mind* (pp. 107-129). (New York: The Philosophical Library).

Bergson, Henri (1946b/1903) "Introduction to metaphysics", in *The Creative Mind* (pp. 159-200). (New York: The Philosophical Library).

Bergson, Henri (1946c) "The possible and the real", in *The Creative Mind* (pp. 91-106). (New York: The Philosophical Library).

Bergson, Henri (1959/1896) *Matter and memory*. (New York: Doubleday).

Bilgrami, Akeel (1995) "Review of A Theory of Content and Other Essays; and Holism: A Shoppers' Guide", *Journal of Philosophy, 92 (6)*, 330-44.

Blair, George A. (1995) "Unfortunately, it is a bit more complex: reflections on Ενεργεια." *Ancient Philosophy, 15*, 565-580.

Blank, Andreas (2003) "Leibniz's De Summa Rerum and the panlogistic interpretation of the theory of simple substances." *British Journal for the History of Philosophy, 11(2),* 261-269.

Bohm, David (1980) *Wholeness and the implicate order*. (London: Routledge).

Brouwer, Anne-Marie, Brenner, Eli & Smeets, Jeroen B.J. (2003) "When is behavioral data evidence for a control theory? Tau-coupling revisited." *Motor Control, 7*, 103-110.

Buchanan, John (2000) "A process, pluralistic universe." *Concrescence: The Australasian Journal of Process Thought, 1*, 1-12.

Bueno, Otavio & Colyvan, Mark (under review) “Just what is vagueness?”

Burtt, Edwin Arthur (1932) *The metaphysical foundations of modern physical science* (revised edition). (London: Routledge & Kegan Paul).

Buss, David M. (1999) *Evolutionary psychology: The new science of the mind*. (Boston: Allyn & Bacon).

Calvin, William H. (1996) *The cerebral code: Thinking a thought in the mosaics of the mind*. (Cambridge, MA: MIT Press, Bradford Books).

Cartwright, Nancy (1999) *The dappled world*. (Cambridge: CUP).

Chappell, V.C. (1963) “Whitehead’s theory of becoming”. In George L. Kline (Ed.) *Alfred North Whitehead: Essays on his philosophy*. (pp. 70-80) (Englewood Cliffs, NJ: Prentice-Hall).

Churchland, Patricia S. & Llinás, Rodolfo (1996) “Introduction”. In Llinás, R. & Churchland, P.S. (Eds) *The mind-brain continuum: Sensory processes*. (pp. ix-xi). (Cambridge, MA: MIT Press, Bradford Books).

Churchland, Patricia S. & Sejnowski, Terrence J. (1992) *The computational brain*. (Cambridge, MA,: MIT Press).

Clark, Andy & Chalmers, David (1998) “The extended mind”. *Analysis, 58*, 7-19.

Code, Murray (2002) “On Whitehead’s almost comprehensive naturalism.” *Process Studies, 31(1),* 3-31.

Cole, Jonathon (1995) *Pride and a daily marathon.* (Cambridge, MA: MIT Press).

Collins, John, Hall, Ned & L.A. Paul (2004) “Counterfactuals and causation: History, problems, and perspectives.” In John Collins, Ned Hall, & L.A. Paul (eds.) *Causation and counterfactuals* (pp.1-58). (Cambridge, MA: MIT Press, Bradford Books).

The Columbia Encyclopedia, “Logical positivism.” 6th ed. New York: Columbia University Press, 2001–04. www.bartleby.com/65/.

Corry, Richard (forthcoming) “Causal realism and the laws of nature.” *Philosophy of Science*.

Crockett, Timothy (1999) “Continuity in Leibniz’s mature metaphysics” *Philosophical Studies, 94*, 119-138.

Dalai Lama (Tenzin Gyatso) (2006) “The Om of physics” *New Scientist, No. 2534, 14 January 2006*, pp.46-7.

Davidson, Donald (2001) “Three varieties of knowledge”, in *Subjective, Intersubjective,*

Objective (pp. 205-220) (Oxford: Clarendon Press).

Davidson, Donald (2005) "The social aspect of language", in *Truth, Language, and History* (pp.109-25) (Oxford: OUP).

De Boer, Karin (2004) "The dissolving force of the concept: Hegel's ontological logic." *The Review of Metaphysics, 57 (4),* 787-822.

Deleuze, Gilles (1988a/1966) *Bergsonism*. (New York: Zone Books).

Deleuze, Gilles (1988b/1970) *Spinoza: Practical philosophy*. (San Francisco: City Lights).

Deleuze, Gilles (1990/1968) *Expressionism in philosophy: Spinoza*. (New York: Zone Books).

Deleuze, Gilles (1993/1988) *The fold: Leibniz and the baroque*. (Minneapolis: University of Minnesota Press).

Dewey, John (1929) *Experience and nature (2nd edition)* (La Salle, IL: Open Court).

Dietrich & Markman (2003) "Discrete thoughts: Why cognition must use discrete representations." *Mind & Language, 18 (1),* 95-119.

Dreyfus, H.L. (1979) *What computers **still** can't do: A critique of artificial reason.* (Cambridge, MA: MIT Press).

Dummett, Michael (1991) *The logical basis of metaphysics*. (Cambridge, MA: Harvard)

Dummett, Michael (2000) "Is time a continuum of instants?" *Philosophy, 75,* 497-515.

Edgington, Dorothy (1997) "Vagueness by degrees". In *Vagueness: A reader* (Ed. Rosanna Keefe & Peter Smith, pp 294-316). (Cambridge, MA; MIT Press/Bradford Books).

Felt, James W. (2002) "Epochal time and the continuity of experience." *The Review of Metaphysics, 56 (1),* 19-36 (pdf pagination differs; Pp.1-12).

Floridi, Luciano (2002) "What is the philosophy of information?" *Metaphilosophy, 33 (1/2),* 123-45.

Fodor, Jerry (1994) *The elm and the expert*. (Cambridge, MA; MIT Press/Bradford Books).

Fodor, Jerry & Lepore, Ernest (1992) *Holism: A shoppers' guide*. (Oxford: Blackwell).

Ford, Lewis S. (1994) "The creation of 'eternal' objects." *The Modern Schoolman, 71*, 191-222.

Frede, Michael (1997) "The sceptic's two kinds of assent and the question of the possibility of knowledge." In Myles Burnyeat & Michael Frede (Eds.) *The original*

sceptics: A controversy (pp. 127-51). (Indianapolis: Hackett).

Gatens, Moira and Lloyd, Genevieve (1999) *Collective imaginings: Spinoza, past and present*. (London: Routledge).

Gibson, James J. (1962) "Observations on active touch." *Psychological Review, 69(6),* 477-91.

Gibson, James J. (1966) *The senses considered as perceptual systems*. (London: George Allen & Unwin).

Gibson, James J. (1977) "The theory of affordances." In Robert Shaw & John Bransford (Eds.) *Perceiving, acting, knowing: Toward an ecological psychology* (pp.67-82) (Hillsdale, NJ: Lawrence Erlbaum).

Gibson, James J. (1979) *An ecological approach to visual perception*. (Boston, MA: Houghton Mifflin).

Gill, Mary Louise (2005) "Aristotle's metaphysics reconsidered." *Journal of the History of Philosophy, 43 (3),* 223-51.

Gilson, Etienne (1952) *Being and some philosophers. (2nd ed.)* (Toronto: Pontifical Institute of Mediaeval Studies).

Hacker, P.M.S. (1972) *Insight and illusion: Wittgenstein on philosophy and the metaphysics of experience.* (Oxford: OUP).

Hall, Everett W. (1963/1930) "Of what use are Whitehead's eternal objects?" In George L. Kline (Ed.) *Alfred North Whitehead: Essays on his philosophy*. (pp. 102-16) (Englewood Cliffs, NJ: Prentice-Hall).

Hampshire, Stuart (1951) *Spinoza*. (Harmondsworth: Penguin).

Heidegger, Martin (1971) "…poetically man dwells…", in Albert Hofstadter (Trans.) *Poetry, Language, Thought.* (NY: Harper).

James, William (1890) *The principles of psychology*. (Chicago: Encyclopedia Britannica Great Books of the Western World Vol.53)

James, William (1955/1907) *Pragmatism: and four essays from The Meaning of Truth*. (NY: New American Library).

Johnson, Mark (1987) *The body in the mind: The bodily basis of meaning, imagination, and reason*. (Chicago: University of Chicago).

Kanizsa, Gaetano (1979) *Organization in vision: Essays on gestalt perception.* (New York: Praeger).

Kant, Immanuel (1929/1787) *Critique of pure reason* (second edition, trans. Norman

Kemp Smith). (London: Macmillan).

Kim, N.G., Turvey, M.T., & Carello, C. (1993). "Optical information about the severity of upcoming contacts." *Journal of Experimental Psychology: Human Perception & Performance, 19*, 179-93.

Kirk, G.S. (1954) *Heraclitus: The cosmic fragments*. (Cambridge: CUP).

Kirk, G.S. & Raven, J.E. (1957) *The presocratic philosophers: A critical history with a selection of texts*. (Cambridge: CUP).

Koenderink, Jan J. (2002) "Continua in vision." In Liliana Albertazzi (Ed.) *Unfolding perceptual continua* (pp 101-18) (Amsterdam: John Benjamins).

Köhler, Wolfgang (1930) *Gestalt psychology*. (London: G. Bell).

Köhler, Wolfgang (1942/1959) *Dynamics in psychology*. (London: Faber & Faber).

Kurzweil, Ray (2006) "Why we can be confident of Turing Test capability within a quarter century" http://www.kurzweilai.net/meme/frame.html?main =/articles/art0683.html (Published on KurzweilAI.net July 13, 2006).

Laing, R.D. (1960) *The divided self: An existential study of sanity and madness*. (Harmondsworth: Pelican Books).

Lakoff, George (1987) *Women, fire and dangerous things: What categories reveal about the mind*. (Chicago: University of Chicago).

Lakoff, George & Johnson, Mark (1999) *Philosophy in the flesh: The embodied mind and its challenge to western thought*. (NY: Basic).

Leibniz, G.W. (1973/1902) *Discourse on metaphysics*.(La Salle, IL: Open Court).

Leibniz, G.W. (1973/1902) *Monadology*.(La Salle, IL: Open Court).

Lehrbaum, Anna (2004) "Logic and conflict". Paper presented at Australasian Association for Philosophy annual conference, South Molle Island.

Levinas, Emmanuel (1998/1951) "Is ontology fundamental?" in *entre nous: Thinking-of-the-other* (pp.1-11). (New York: Columbia University).

Lewis, David (2004) "Causation as influence." In John Collins, Ned Hall, & L.A. Paul (eds.) *Causation and counterfactuals* (pp.75-106). (Cambridge, MA: MIT Press, Bradford Books).

Llinás, R. & Paré, D. (1996) "The brain as a closed system modulated by the senses." In Llinás, R. & Churchland, P.S. (Eds) *The mind-brain continuum: Sensory processes*. (pp. 1-18). (Cambridge, MA: MIT Press, Bradford Books).

Lombardo, Stanley (1982) *Parmenides and Empedocles: The fragments in verse*

translation. (San Francisco: Grey Fox Press).

Loftus, Elizabeth (1975) "Spreading activation within semantic categories: Comments on Rosch's 'Cognitive representations of semantic categories'". *Journal of Experimental Psychology: General, 104 (3)*, 234-240.

Malpas, Jeff (1994) "Self-knowledge and scepticism", *Erkenntnis, 40*, 165-84.

Malpas, Jeff (2005) "Donald Davidson", *The Stanford Encyclopedia of Philosophy* (Summer 2005 Edition), Edward N. Zalta (ed.), http://plato.stanford.edu/archives/sum2005/entries/davidson/.

Markman, Arthur B. & Dietrich, Eric (2000) "In defense of representation." *Cognitive Psychology 40***,** 138–171.

Marr, David (1982) *Vision: A computational investigation into the human representation and processing of visual information*. (San Francisco: W.H.Freeman).

Mathews, Freya (1991) *The ecological self*. (Savage, MD: Barnes & Noble)

Maturana, Humberto R. (1980) "Introduction." In Humberto Maturana & Francisco Varela (Eds.) *Autopoiesis and cognition: The realization of the living*. (pp.xi-xxx) (Dordrecht: D.Reidel).

Maturana, Humberto R. & Varela, Francisco J. (1980) "Autopoiesis: The organization of the living." In Humberto Maturana & Francisco Varela (Eds.) *Autopoiesis and cognition: The realization of the living*. (pp.63-134) (Dordrecht: D.Reidel).

McHenry, Leemon B. (1992) *Whitehead and Bradley: A comparative analysis*. (New York: SUNY).

Merleau-Ponty, Maurice (1962) *Phenomenology of perception* (Trans. Colin Smith). (London: Routledge).

Mirus, Christopher V. (2004) "The metaphysical roots of Aristotle's teleology." *The Review of Metaphysics, 57 (4)*, 699-724.

Morris, David (2004) *The sense of space*. (Albany, NY: SUNY).

Mullarkey, John C. (1994) "Duplicity in the flesh: Bergson and current philosophy of the body." *Philosophy Today, 38, 4*, 339-55.

Mullarkey, John C. (1995) "Bergson's method of multiplicity." *Metaphilosophy, 26 (3)*, 230-59.

Murphy, Gregory L. & Lassaline, Mary E. (1997). "Hierarchical structure in concepts and the basic level of categorization". In Koen Lamberts & David Shanks (Eds.) *Knowledge, concepts, and categories* (pp.93-131). (Cambridge, MA: MIT Press).

Naess, Arne (1989) *Ecology, community and lifestyle: Outline of an ecosophy*. (Trans. & revised by David Rothenberg) (Cambridge: CUP).

Nagel, Thomas (1986) *The view from nowhere*. (NY: Oxford).

Norwich, Kenneth H. (1993) *Information, sensation, and perception*. (San Diego: Academic Press).

Nussbaum, Martha (1986) *The fragility of goodness: Luck and ethics in Greek tragedy and philosophy*. (Cambridge: CUP).

Palmer, Daniel K. (2004) "On the organism-environment distinction in psychology." *Behavior and Philosophy, 32*, 317-347.

Parsell, Mitch & Wilson, Bruce (under review) "Discreteness, in-discreteness, and the character of mental states."

Parsons, Terence & Woodruff, Peter (1997) "Worldly indeterminacy of identity". In *Vagueness: A reader* (Ed. Rosanna Keefe & Peter Smith, pp 321-337). (Cambridge, MA; MIT Press/Bradford Books).

Peirce, Charles S. (1958a/1868) "Questions concerning certain faculties claimed for man". In *Charles S. Peirce: Selected writings – values in a universe of chance*. (Ed. Philip P. Wiener, pp.15-38) (New York: Dover).

Peirce, Charles S. (1958b/1905) "What pragmatism is". In *Charles S. Peirce: Selected writings – values in a universe of chance*. (Ed. Philip P. Wiener, pp.180-202) (New York: Dover).

Peirce, Charles S. (1958c/1904) "Letters to Lady Welby". In *Charles S. Peirce: Selected writings – values in a universe of chance*. (Ed. Philip P. Wiener, pp.380-432) (New York: Dover).

Peitgen, Heinz-Otto, Jürgens, Hartmut & Saupe, Dietmar (1992) *Chaos and fractals: New frontiers of science*. (New York: Springer-Verlag).

Plato. *The Republic*.

Porges, S.W. (1995) "Orienting in a defensive world: Mammalian modifications of our evolutionary heritage: A polyvagal theory." *Psychophysiology, 32*, 301-317.

Price, Huw (1996) *Time's arrow and Archimede's point: new directions for the physics of time*. (New York: OUP).

Prigogine, Ilya, & Stengers, Isabelle (1984) *Order out of chaos: Man's new dialogue with nature*. (London: Flamingo).

Putnam, Hilary (1975) "The meaning of 'meaning'". Reprinted in *Mind, language and*

reality, philosophical papers, volume 2, (pp. 215-271) (London: CUP).

Quine, W.V.O. (1994) "Epistemology naturalized". In *Naturalizing epistemology* (2nd. Ed, edited Hilary Kornblith, pp.15-31) (Cambridge, MA: MIT Press/Bradford Books).

Reed, Edward (1996) *Encountering the world: Toward an ecological psychology*. (Oxford: OUP)

Rescher, Nicholas (2001) *G.W.Leibniz's Monadology: An edition for students*. (Pittsburgh: University of Pittsburgh Press).

Rescher, Nicholas (2002) "Process philosophy", *The Stanford Encyclopedia of Philosophy (Summer 2002 Edition)*, Edward N. Zalta (ed.), http://plato.stanford.edu/archives/sum2002/entries/process-philosophy/.

Rosenthal, Sandra B. (2000) *Time, continuity, and indeterminacy: A pragmatic engagement with contemporary perspectives*. (New York: SUNY).

Rosch, Eleanor (1975a) "Cognitive representations of semantic categories." *Journal of Experimental Psychology: General, 104 (3)*, 192-233.

Rosch, Eleanor (1975b) "Reply to Loftus." *Journal of Experimental Psychology: General, 104 (3)*, 241-243.

Ross, W.D. (Sir David) (1953/1924) *Aristotle's Metaphysics: A revised text with introduction and commentary*. (London: Oxford).

Russell, Bertrand (1912) *The problems of philosophy*.(Oxford: OUP).

Russell, Bertrand (1922) "Vagueness". Lecture to the Jowett Society, 25 Nov 1922.

Russell, Bertrand (1961) *History of western philosophy (2nd ed.)* (London: George Allen & Unwin).

Schwitzgebel, E. (2001) "In-between believing." *Philosophical Quarterly, 202*, 76-82.

Sheets-Johnstone, Maxine (1999a) *The primacy of movement*. (Amsterdam: John Benjamins).

Sheets-Johnstone, Maxine (1999b) "Emotion and movement: A beginning empirical-phenomenological analysis of their relationship." *Journal of Consciousness Studies, 6, (11-12)*, 259-77.

Sherburne, Donald W. (1986) "Decentering Whitehead." *Process Studies, 15 (2)*, 83-94.

Sherburne, Donald W. (1994) "Some reflections on Sartre's nothingness and Whitehead's perishing." *Review of Metaphysics, 48*, 3-17.

Sloan, Phillip R. (2002) "Preforming the categories: Eighteenth-century generation

theory and the biological roots of Kant's a priori." *Journal of the History of Philosophy, 40 (2),* 229-253.

Smolensky, P. (1988) "On the Proper Treatment of Connectionism." *Behavioral and Brain Sciences, 11*, 1-74.

Spinoza, Benedict de (1955/1883) *The ethics*. (Trans. R.H.M.Elwes). (New York: Dover).

Spinoza, Benedict de (1955/1883) *Correspondence*. (Trans. R.H.M.Elwes). (New York: Dover).

Strawson, P.F. (1959) *Individuals: An essay in descriptive metaphysics*. (London: Methuen University Paperbacks).

Thom, Rene (1975) *Structural stability and morphogenesis: An outline of a general theory of models*. (Reading, MA: W.A.Benjamin).

Thomas, Nigel J.T. (1999) "Are theories of imagery theories of imagination? An active perception approach to conscious mental content." *Cognitive Science, 23,* 207-245,

Turvey, M.T. & Carello, Claudia (1995) "Some dynamical themes in perception and action." In Robert F. Port & Timothy Van Gelder (Eds.) *Mind as motion: Explorations in the dynamics of cognition* (pp. 373-401). (Cambridge, MA; MIT Press/Bradford Books).

Turvey, M.T. & Shaw, Robert E. (1999a) "Ecological foundations of cognition: I. Symmetry and specificity of animal-environment systems." *Journal of Consciousness Studies, 6 (11-12),* 95-110.

Turvey, M.T. & Shaw, Robert E. (1999b) "Ecological foundations of cognition: II. Degrees of freedom and conserved quantities in animal-environment systems." *Journal of Consciousness Studies, 6 (11-12),* 111-23.

Tye, Michael (1997) "Sorites paradoxes and the semantics of vagueness". In *Vagueness: A reader* (Ed. Rosanna Keefe & Peter Smith, pp 289-293). (Cambridge, MA; MIT Press/Bradford Books).

Tzouvaras, Athanassios (1998) The order structure of continua. *Synthese, 113*, 381-421.

Van Haeften, Chris (2001) "Extension and epoch: Continuity and discontinuity in the philosophy of A. N. Whitehead." *Transactions of the Charles S. Peirce Society, 37(1),* 59-79.

Vlastos, Gregory (1963/1937) "Organic categories in Whitehead." In George L. Kline (Ed.) *Alfred North Whitehead: Essays on his philosophy*. (pp. 158-67) (Englewood

Cliffs, NJ: Prentice-Hall).

Vygotsky, Lev Semenovich (1962/1934) *Thought and language*. (Cambridge, MA; MIT Press).

Whitehead, Alfred N. (1933) *Adventures of ideas*. (Harmondsworth: Penguin).

Whitehead, Alfred N. (1963/1936) "Unpublished letter to Charles Hartshorne, Jan 2, 1936". In George L. Kline (Ed.) *Alfred North Whitehead: Essays on his philosophy*. (pp. 198-9) (Englewood Cliffs, NJ: Prentice-Hall).

Whitehead, Alfred N. (1978/1929) *Process and reality (corrected edition).* (New York: Free Press).

Wierzbicka, Anna (2003) *Cross-cultural pragmatics: The semantics of human interaction.* (New York: Mouton de Gruyter).

Wittgenstein, Ludwig (1981/1922) *Tractatus logico-philosophicus*. (Trans. C.K.Ogden). (London: Routledge).

Wittgenstein, Ludwig (1953) *Philosophical investigations (third edition).* (New York: Macmillan).

Wittgenstein, Ludwig (1992) *Last writings on the philosophy of psychology. Vol.2: The inner and the outer*. (Oxford: Blackwell).